The Builder.

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On the Study of True Comfort in Architectural Design.

IF it be asked what is the first requisite for the architect to bear in mind in preparing a design for a dwelling-house, we think there can be no doubt that the reply should be, domestic comfort. Under that term we, of course, include thoroughly good sanitary arrangements; as, in the absence of due attention to that part of the case, comfort will prove both illusory and transient.

Now if it be asked what is the object which the builder who works, not on commission or under contract, but on speculation, first proposes to himself, there can be but little hesitation in giving the reply,—profit. We are not speaking with any disrespect of the fair profit of trade. That gain is, indeed, the very cause of the existence of trades and tradesmen. Nevertheless, it must be admitted that these two poles, that of comfort, and that of profit, are in themselves opposed. The reasonable tenant or owner who seeks for comfort must be prepared to pay the fair price for his house, including the proper remuneration of the tradesfolk. As to the modest commission of the architect, we cannot fairly debit his client with any outlay on that score, because, if a man is determined to build, this payment invariably saves itself, and that generally many times over.

On the other hand, we must remember that very much of that building which has so happily transformed much of the aspect of London has been of a speculative nature. The erection of a certain class of house, superior, it may be, to those formerly built in the neighbourhood, in the anticipation that tenants will be forthcoming, is indeed speculation; but it is speculation of a very desirable nature. Against such enterprise we should be the last to speak. But the extreme of what is generally meant by speculation has been illustrated by the proceedings of a police-court within the last few days; where a builder was condemned to pull down three houses, some of a set of which other individuals had saved him the trouble, by falling down of their own accord, and in which the mortar that was used was described as crumbling between the fingers like snuff. Between the utterly indefensible character of work of this nature, and the stupid productions of the amateur, who thinks to save the expense of an architect, there is a wide range of imperfect building. It is to work of this kind that we have alluded under the term "speculative." We should be very glad to be provided with a more appropriate adjective to designate aright this large group of imperfect or bad work.

Now the question which seems to us to deserve very much more attention than it habitually receives, is this. How far is the actual state of science, as regards those appliances which tend to comfort, to health, and to true economy, taken as the basis of design? How far is the intending occupant aware, as a rule, of what the best building appliances yet known are? How far is the architect or the builder in the habit of saying "Such and such improvements are very well worth their cost"? We are not now speaking of anything of an æsthetic character, but of those structural matters which it is absolutely essential to judge on their own merits.

We very much fear that the severe winter of the last few weeks has furnished, to three people out of four, a good reason for raising some such inquiry as that above suggested. Indoors and out, in the streets, in the coal-cellars, in the water arrangements of the house, comfort has been destroyed, and cost has been incurred, by absolute want of forethought and good arrangement, and, we hold, owing to little besides.

The remarks which have recently appeared in our columns under the head of "Smokeless London," open up one head of inquiry connected with the subject, which cannot be permitted to drop without fuller discussion. The columns of some of our daily contemporaries have been full of complaints of those nuisances from bursting pipes which have been general, but not universal. And if this is the case, if in nine houses out of ten the pipes burst after or during a frost of some intensity, while in the tenth house they do not, it is evident that it becomes matter of paramount importance to inquire into the exceptional conditions, with the view of making them the normal conditions.

One gentleman, who does not give his name, writing from Lincoln, advocates a plan which he ascribes to a medical man in Northamptonshire, and which he says was found to answer very well in practical use. A hot-air chamber, something resembling the oven of a kitchen range, is inserted in the sitting-room walls on each side of the fire-grate, behind the jambs of the chimney-piece. From these chambers iron pipes form a channel of communication with the rooms above, to which the air warmed in the chambers is admitted through ventilators in or above the skirting-boards. It is not said how the air is admitted to the proposed chambers; but this is probably by pipes communicating with the external air.

This arrangement has been proposed again and again in various forms, and adopted in some Objections can be raised to it. But we can have no doubt that the projector has been struck, as all reflective persons must be, with the two unfortunate features that characterise our warming arrangements in ninety-nine cases out of a hundred, viz., waste of heat and irregularity of ventilation.

The fire-place in modern houses has assumed a conventional form which is only intelligible by tracing its history.

We may take Conisborough Castle for an example of the most ancient form of chimney still existing in England. This building was erected in, or close upon, the Anglo-Saxon period. In the great guard-room is a large fire-hearth. The opening is made in the thickness of the wall, with an arch above; but two transom stones, forming a projecting mantel-shelf, are built in, and supported by two sets of clustered pillars. An aperture, of a gradually contracting form, ascends from the back of the fireplace, and from the back of the mantel-shelf, sloping outwards as it rises through the thickness of the wall, till it reaches a loop-hole at a considerable height above the floor of the guard-room, where the smoke finds an exit. In other castles built about the same time will be found also slanting smoke-tunnels formed in the thickness of the walls, and terminating in loop-holes. Unfortunately, our usual modern thicknesses of external walls do not allow of this simple and effective mode of ensuring ventilation. Rochester, Kenilworth, Conway, and, we believe, Guildford, castles show chimneys similar to that of Conisborough.

The substitution of the manorial dwelling-house for the feudal castle occurred about the same time as the abandonment of plate armour, and for the same reason,—the introduction of gunpowder. As soon as it was discovered that the narrow keep, or the intolerably heavy panoply, failed to give absolute security, the love of comfort led to the disuse of these ancient modes of defence. With the manor-house came in the chimney,—built, in many noble houses of Tudor times, as an independent and essential structural feature. In the old manor-house at Chenies, the Buckinghamshire village which contains the mortuary chapel of the Dukes of Bedford, may be seen a series of massive square brick towers, projecting from the line of the building, and terminating in noble chimney-stacks. Within, the tower opened on the ground floor, affording a true chimney-corner,—a sort of recess or small chamber, in which wooden logs were piled on iron dogs, throwing a glow into the whole apartment, and allowing of the arrangement of benches within the recess, or around the chimney-corner, as it is called, which in long winter evenings thus became a nook affording warmth and comfort. Perhaps few things in the arrangements of modern luxury have the rude and hearty comfort of the chimney corner. Of such a nook, no doubt, Master Abraham Slender was thinking, when he uttered the adjuration, "Or I would I might never come in mine own great chamber again else." From this comfortable and stately beginning, the chimney has both advanced and decayed. It

has risen, as an independent tower, to the height of 468 ft. from the foundation, and 454 ft. above ground, in the case of the Port Dundas Works at Glasgow. In this noble smoke-tube the outside diameter at the ground level is 32 ft.; the thickness, seven bricks. This diminishes to an outside diameter of 12 ft. 8 in., with a thickness of a brick and half at the top. Only two church spires in Europe,—that of the Strasburg Cathedral, and that of St. Stephen's Church at Vienna,—exceed the height of this lofty chimney, which is greater than that of the Great Pyramid in its present state. The horizontal section is circular throughout; the batter is straight, and there is no cap.

From the chimney-corner, as has been intimated, has been derived the modern chimney-piece. And one necessity, as it was long held to be, has preserved the inconvenient form of the chimney-piece until it has taken the place of an institution; that was the necessity of so constructing the chimney as to leave room in it for the passage of a small boy to sweep it out. It is not so many years since that this intolerable barbarism has been abolished, thanks to the indignant exertions of the poet James Montgomery, and a few like-minded individuals. But though we no longer send boys up our chimneys, we preserve the form and structure that had become usual for that purpose. And here is one of our great sources of discomfort and of waste.

We apprehend that there can be no doubt that if, for the roughly-built square flue, to accommodate which we sacrifice so much of the room and of the good appearance of our ordinary chambers by the projection of the chimney-breast, were substituted well-made, well-fitted, smoothly-lined earthen pipes, a great improvement would result, both in comfort and in economy. It may, perhaps, be held inconsistent with our English views of what is becoming to allow these tubes to be visible, whether as detached or semi-detached from the walls; although an immense economy of fuel would be the result. By such an arrangement a fire in a room below would raise the temperature in the floors above, at least enough for health. And the great improvement lately made in terra cotta and other kinds of earthenware is such that a very charming effect might be produced from a group of hollow columns or ornamental pipes. For with the introduction of a smoke-tube, which would afford less friction and less opposition to the escape of the draught than our present flues (and which would be much more readily and effectually cleaned by the use of the ordinary jointed rod, which has superseded the climbing-boy), should be associated tubes for ventilation, and, in large rooms, for the supply of fresh air. These ventilating tubes would also give a commodious passage to gas-pipes and to water-pipes, and might easily be so arranged as to prevent the bursting of the latter. This, in some cases, has been attempted by building them in close to the flues. But the evil of the heat in summer is such as to counteract the good effect of the warming thus effected in winter.

To those persons whose taste condemns the visible introduction of warming and ventilating tubes in their apartments, and who are willing to pay for the extra fuel, or to suffer the extra cold, due to the retiring of the smoke-tubes into the walls, the advantages of the substitution of the smooth pipe for the plastered (or unplastered) flue will still be considerable. The advantages of the ventilating-tubes will be no less. It will be a question, in such an arrangement, whether the extra thickness that will probably be required in the walls, in order to include the tubes, in most cases had not better be added without, rather than within, the building. The rooms would then be rectangular; not diminished as is nowthe case by the projecting breast. The outer wall will be strengthened by the projections, which would resemble the "building strips" of the old Anglo-Saxon work, and in case of houses built in pairs or in rows, the gain to comfort would be so great as fully to make up for the loss of 4½ in. or 9 in. in the width of a room. For the chimneys being built, to carry the smoke and air-tubes, as mere thickened parts of the wall, the remainder of the party-wall would be double, with a narrow space between the two faces, which would prove a more effective non-conductor of sound from house to house than a solid wall of equal thickness. Economy and comfort would be thus combined.

Without attempting to force any nostrum on the profession, we beg very seriously to call the attention of architects to the great addition which may be made to the health and comfort of houses by a reconsideration of the rude, wasteful, inefficient form of chimney which has descended, as before intimated, from the rude snugness of the great chambers and great fireplaces of Tudor times. And this tends to the consideration of the advantage or disadvantage, in cities and in towns, of that use of the open fire to which we feel, for the most part, so national a devotion.

Referring our readers to the remarks which they will find in our present volume (p. 88), we will ask them to look a little further at the question of the economy of heat. Let us admit, once for all, that we give up the question of the drawing-room fire. So accustomed are we to associate much of the charm of the winter season with a cheerful blaze, that we will consider this as an extravagance as much to be taken for granted as the Christmas pudding, or any other extra cost allowed for the sake of the pleasure which it conveys, and thus not to be judged of on purely economical principles. And we may add that if the economy which may be easily effected in fuel be carried out in other parts of the house, not only may the best and most brilliantly-burning coals be consumed in the drawing-room, but the blaze may be improved by the addition of wood, especially of those blocks of oak, to be obtained from the ship-breakers, which, imbued with the salt of the sea, burn with so beautifully-coloured a flame.

In America, we are told, an attempt is now being made to warm New York by steam, and not only to warm each block of buildings from a central boiler, but also to supply to each house an ever-available motive power to work lifts, to pump water, or to drive any kind of machinery. It is the part of wisdom rather to await the result of experiments which are said to be in actual progress than to predict what that result will be. Still there are manifold objections to the scheme, supposing it to be at all practicable. The great drawback would be the loss of heat from conduction and radiation from the pipes. To this the projectors reply that they have a substance of remarkably non-conducting character with which to surround their mains. We suppose that if a smaller pipe, conveying steam, were placed in the midst of a larger pipe, and blocked at intervals with cork, so as not to touch the external pipe, the greatest economy of heat would be obtained. But to supply at considerable distances, and at any moment, a head of hot, dry steam, the pressure on the boilers used, and on every part of the apparatus, must be very great. Constant supervision would be required to detect and to cure leakage. Great strength would be required in the fittings. The danger of explosion would not be absent, and the effective nature of the whole apparatus, in case of any sudden fall in temperature, is as yet problematical. Besides this, it would require the assent of every householder in a street or block of buildings to allow of the laying of the steam mains through his property; whether he adopted the new plan or not. How far the patriotism of the inhabitants of New York renders this objection idle we are not aware. In England it is certain that nothing less than an Act of Parliament would enable any steam warming company to advance a single yard; so that, on the whole, we think it safe to adjourn any further consideration of the question of warming by steam from a central station until notices are lodged of an application to Parliament for the incorporation of a company for that purpose.

It is quite another matter to inquire into the source of the most economical application of heat for domestic purposes. We have occupied too much space already to bring forward on the present occasion the remarkable statistics which we have collected on this score, and which must be deferred to some future occasion. But we may call attention at least to one item, illustrative of the great cost of our open coal fires. In the last week in January the price advertised in the daily papers for the delivery of the best coal, at the house, in London, was 29s. per ton. In three cases out of four another 6d., or even 1s., will be added to secure the civility and ready aid of the servants of the coal merchant. During the same week the price of the best coals in the river was quoted at 16s. 6d. per ton. Now we are not mentioning this with any idea of intimating that the profits of the London coal merchants are too high. The great competition ever existing in an open retail trade must prevent that from being the case, to any great extent; still the difference in price, however justifiable, is very great. There will be river-dues, that must fall on any purchaser, landing dues, cost of carriage to the merchant's yard, cost of yard, cost of offices, cost of re-loading, cost of distribution; proper profit on all this outlay. Then comes the cost of removing the unburnt products of combustion, whether deposited as smoke in the chimney or as ashes in the grate. When all these things are added to the proper wholesale price of coal on a river or railway wharf in London, it will be seen that the private consumer has to pay from 50 to 100 per cent. more than the wholesale consumer.

To this we will only now add that the waste of the fuel, when delivered at so high a charge in the private coal-cellar, is something enormous. The best and most economical appliances known to engineers do not obtain, from the consumption of coal, more than the tenth or twelfth part of the heat which, according to chemical analysis, that coal actually may be made to yield on a true combustion. He would be a very sanguine person who should estimate that we practically derive, from our domestic consumption of fuel, a third of the useful heat which is obtained from the combustion of the equal quantity of fuel under a boiler, when fire-grate, flues, and draught, are all carefully arranged so as to make the best of the fire. The architect then, who is planning a house in which each chamber is designed with the usual projecting chimney-breast, open grate, and brick flues, has to bear in mind that he is condemning his client to the most wasteful consumption of fuel which can be contrived, next to a bonfire in the open air. He renders necessary the visit of the chimney-sweeper to every room, with the certainty that at each visit he will leave the corners of the flue full of soot, and take as little soot from the sides of the flue as possible. He involves his client in an annual purchase of fuel at a price exceeding the wholesale price at the adjoining river, canal, or railway wharf of from 50 to 100 per cent.; and he ensures, as far as his efforts go, the regular combustion of that costly fuel in a mode that allows the householder to make use of only from 1-30th to 1-40th part, or even less, of its true heating power. Do not these facts call for a little serious consideration on the part of the designers as well as of the occupants of city houses? Economy of heat is a main element of both comfort and health. Can we say that the question, how best to insure economy of heat, has yet received due attention from the architect or from the builder?

THE COPYRIGHT QUESTION.

There will be a good deal to be done before this vexed question of copyright, so far as it regards works of art, can get placed on a footing that is at once intelligible and satisfactory to all parties. Satisfactory to all parties indeed, we imagine, no law upon artistic copyright ever can be, until human nature, of the artistic persuasion at least, is very much changed. For in regard to these questions, touching on the business side of art, we fear that artists are rather as clergymen are sometimes said to be in matters of business,—possessed with an idea that they have a right, as spiritual benefactors of mankind, to special concessions in their favour, such as can hardly be made without injustice to the rights of others. The purchasers of works of art rarely look upon it in the same light, so that there is abundant matter for contention.

As will have been observed by those who have followed the report of the recent meeting of artists, convened at the Grosvenor Gallery, to consider the subject, the meeting (and those whose views they represented) were afraid that the new legislation on copyright which we are promised would only have the effect of bringing the artists out of the frying-pan into the fire. At present the copyright of a picture may be specifically claimed and retained by the artist at the sale of the work; but if it is not so retained, its life is cut short, it vanishes into thin air and ceases to be a recognisable property or entity. Hopes had been entertained that the commission which has been sitting on the subject would fix the copyright with the artist unless specially bought along with the picture by the purchaser; and the artists want this, for this very intelligible reason, that under the existing law they cannot secure the copyright without

drawing the purchaser's attention to the subject, and that the purchaser is then aggrieved, and regards himself as a person who is being defrauded of part of the advantage in the possession of the picture which he is paying for. And knowing as we do the prejudices and the frequently suspicious nature of the English public in regard to dealings in works of art, we can hardly feel that the difficulty of the artists is by any means an imaginary one. Indeed, the situation is rather delicate, put it how you will. By the existing law, the artist has practically to say to the purchaser who has just agreed to take his picture, and is, so to speak, in the very act of writing a cheque for it, "You are not in return for this to have the whole power of doing what you please with this picture; you may keep the actual picture and have the pleasure of looking at it, but you cannot have it engraved or otherwise copied: that is my privilege, and I must have access to the picture or the loan of it for that purpose, if necessary." Whether this last claim would be legally capable of being enforced we cannot say; we should be disposed to think not, and that as the purchaser has bought the original picture he has, at least, the power over its actual material existence, and can lock it up if he chooses; the artist's hold over the copyright being, in fact, rather a negative power, to prevent any one else copying the work, than a positive power to copy it or have it copied for himself. But for all that, the way in which we put it above is probably the way in which it would present itself to the mind of the purchaser, and, of course, we cannot wonder that a considerable proportion of purchasers would be liable to take fright or to feel annoyance at this kind of condition attached to the purchase, and that artists have consequently felt shy of mentioning so delicate a matter at all, and have preferred that the copyright should vanish before any trouble came of it. And, of course, if the law provided that the copyright was by tacit understanding the artist's unless otherwise stipulated, this difficulty about bringing it on the *tapis* would, at any rate, be at an end. But the present recommendation in regard to fresh legislation is to leave the matter just where it stands at present so far as any wish of the artist for the copyright is concerned; that is to say, he must bargain for it if he wants it; but to rule that otherwise it does not vanish as before, but is tacitly passed over to the purchaser.

This, it should be observed, is already the case with pictures painted *as commissions*; a provision made in our present confused and illogical body of copyright law, in order to prevent the unauthorised copying of portraits, which may in a sense be regarded as works in which the personal interest of the proprietor is greater than in the case of other classes of paintings. This, it seems to us (though it is not so stated in their Report), is what really gave to the members of the Copyright Commission the bias in favour of the line of legislation they have recommended. They place on record their difficulty in making any definite legal discrimination between what is or is not a picture painted "on commission," or even apparently in defining (for purposes of legislative action) what is or is not "a portrait." They have, therefore, cut the knot by putting all pictures under the same conditions as those under which they find portraits and commissioned pictures under the existing law. This is not of course the way it appears in the Report, but this is pretty nearly what it amounts to. It is an easy way out of what is no doubt a difficulty. The Commission arrived at the conclusion that, on the basis of the evidence furnished to them, "no distinction can practically be made between works painted on commission and those not so painted." They then continue:—

"111. The only question that remains, therefore, on this branch of our inquiry, is, whether the copyright of a picture when sold should still be vested in the artist, or whether, unless expressly reserved, it should follow the ownership of the picture.

"112. The evidence shows that persons buying pictures do not in general think about the copyright, but that if the subject happens to be mentioned, they are generally under the impression that the copyright is included in the purchase, and are astonished if they are told that it is not. It is said that owing to this fact an artist, however eminent, when he is selling a picture, shrinks from mentioning the copyright and asking for an agreement to enable him to retain it; he usually prefers that the copyright should be absolutely lost to both parties, as in the absence of any written agreement it would be, under the first section of the Act that was passed in the twenty-fifth and twenty-sixth years of your Majesty's reign (c. 68), than that the purchaser should think that he is losing a valuable part of his bargain, and consequently should decline to complete the purchase.

"113. The principal reason why artists wish to retain the copyright is to keep control over the engraver and photographer. To artists no doubt this control is a matter of considerable pecuniary value, but they urge that they not only wish to control engraving in order to get payment from the engraver, but chiefly to prevent inferior engraving, which they consider prejudicial to their reputation. It is admitted that if a picture is sold, the artist would have no power to get it engraved when it is in possession of the purchaser, except by his consent, and artists are willing that this should continue to be the case; but if this power of preventing engraving is so valuable, it is not easy to see why they should hesitate to explain the law to the purchaser and offer to let him have the copyright if he will preserve the picture from inferior engraving, rather than let the copyright be lost both to artist and purchaser."

This last clause is a full justification of the complaint which was made on behalf of the artists by Sir Coutts Lindsay, as chairman of the Grosvenor Gallery meeting, that no artist had found a place on the Royal Commission, and that consequently the views and feelings of artists were not represented by any one who could really understand or sympathise with them. The omission is really an extraordinary one, considering that every other branch of intellectual labour liable to be affected by the copyright law was represented among the "trusty and well-beloved" persons who formed the Commission. The result is seen in the above clause of the Report. The combined experience of the trusty and well-beloved is not equal to understanding why artists should wish on artistic grounds to control the choice of an engraver and the execution of the engraving; why they can not "explain the law to the purchaser" and solicit him to be careful in seeing that the picture is done justice to if engraved. Touching faith in the judgment, critical insight, and good will of the purchaser! But we fear, with their experience of what these qualities amount to in the average purchaser of pictures in England, the artists will hardly be satisfied to leave their artistic repute, as affected by engraving and other reproduction, in his hands. This is really a very important point indeed for artists, and one of which it is obvious that the Commissioners do not feel the full importance, or they would not talk so lightly of relegating it to the purchaser. In a former article on the subject* we pointed out how great a wrong was done to an artist, a wrong which he was almost powerless to prevent, by inartistic or vulgar copies and reproductions of his works; a wrong which, unless he happens to be really in needy circumstances, is a much more serious one to him than any mere pecuniary damage from infringement of copyright.

It is possible to see the matter from two sides in regard to the capability of legislating on it. It might reasonably be urged that to legislate at all in regard to the copyright of an imaginative work of art is a very difficult matter, and that it might be better left to the stipulation of the artist with his purchaser, in regard to the special circumstances of each case. But though this would avoid some manifest difficulties in formulating a law, it would leave scope for a great deal of very undesirable dispute between artists and purchasers. And our own impression is most distinctly (and we are by no means disposed to side with artists against the public, being in regard to this question a portion of "the public" ourselves) that right to all parties is much more likely to be done by legislating that the artist should have the copyright unless otherwise stipulated than by the reverse process which the Commissioners recommend, of giving it to the purchaser unless otherwise stipulated. The Commissioners seem to have been decidedly impressed by the average public feeling on the subject; by the fact, which they have in evidence from artists, that when a purchaser finds he is not obtaining the copyright in paying for the picture, he usually "expresses very great surprise"; and the Commissioners seem to think that anything at which the English public are very much surprised is likely to be an injustice or opposed to common sense. English people are, however, very much surprised frequently about matters in connexion with art which, nevertheless, are no legitimate grounds for surprise if they only knew it. And in regard to this present question there is one special reason why it seems to us that fair play to all parties is much more likely to be done by assigning the copyright to the artist in default of other arrangement. For this reason: all that the purchaser wants in regard to the copyright is a matter of business: he wants to secure his purchase against depreciation in the market by copies or repetitions, and he also wishes, perhaps, to be in a position to make an advantageous bargain with engravers or publishers. But the artist has an additional interest, sometimes of much more value to him than any pecuniary gain that is to be got out of the copyright, viz., the desire to preserve his artistic reputation from injury by inartistic reproductions; and this is exactly the point in regard to which it is most difficult to make a business bargain; it is a point difficult to formulate in the way of stipulation, and it is still more difficult for the person most interested to see that it is carried out. The artist may, in selling the copyright, "explain the state of the law to the purchaser" (if he can understand it himself), and he may state to the purchaser his wish that the picture should only be engraved by persons capable of doing justice to it; but, after all, when the purchaser has once got the copyright, he will be practically the sole judge of this, and the only safeguard of the artist will be in the existence of an exceptionally conscientious feeling on the part of the purchaser, leading him to consult the artist in such a case as a matter of moral duty. But we sadly fear that a large number of purchasers of paintings would be only too likely to act on the simply-expressed formula that they may "do what they like with what is their own"; and the only way for the artist really to protect himself would be to sell the copyright, subject to a written stipulation that only Brown was to be employed to engrave it, or, in a negative form, that Jones & Robinson were *not* to do it: the first might be often inconvenient, the latter always invidious. On the other hand, if the copyright were vested in the artist in the absence of any contrary stipulation, he might, in cases in which he felt it of importance to his reputation to keep an eye over the engraving of it, quietly do so without the necessity of entering into a bargain which it would be difficult to formulate, and impossible to ensure the observance of on the part of the other party to it.

So far we have been taking up the artist's side in the matter, which has been misunderstood and unduly neglected. There is, of course, also the side of the purchaser to be considered. We do not consider, however, that there can be the slightest injury to the purchaser in the fact that the copyright remains with the artist in the absence of formal agreement, provided the law of the matter is clearly understood, so as to give the purchaser no pretext for being "surprised." The copyright is in most cases of far more real importance to the artist than to the purchaser, and this is the more the case in proportion to the genius and reputation of the artist. In the case of portraits, which, as we have said, are of more direct personal interest to their possessor, it would probably be found that in most cases the purchaser would be unwilling to have the portrait without the copyright, and would therefore be more ready to offer the additional sum for the copyright; and if the artist for his own reasons stood out against selling the copyright at all, it would simply be a question of whether the purchaser thought it more to his interest to have his portrait without the copyright or not to have it at all; the matter would adjust itself as bargains are generally adjusted. If the artist found that by refusing to sell the copyright of portraits he drove away sitters, he would have either to relax his determination or to be content with giving up that branch of art, if he chose so to do. There would be no hardship to either party in such a case. But there is a question of some importance in which the duties of the artist are to be considered, and have sometimes been overlooked; that is, in regard to replicas. There can be no question that there has been a want of conscience among some artists on this point, or, at all events, a considerable confusion of ideas as to what they had or not a right to do. On the side of the artists it is urged sometimes that the value of a painting to its possessor is in no way impaired by the fact of another man having an equally good and similar painting of the same subject: that the object of a painting being really intellectual pleasure, this is the same to the possessor as if it were shared with fifty other people; that if the artist choose to give the same labour and talent over again to the same subject, there is no reason why he should not be paid again for it. But this idea would strike at the very root of copyright in works of intellectual value. It would be as reasonable to say that when the right of production of a drama had been bought by one theatre there was no prejudice done in selling it also to another

* *Builder*, vol. xxxvi., p. 234.

at some distance; that the same audience could not hear both, &c. Every one can see what a totally weak and even indefensible position that would be to take up; but the case of the picture is really analogous. It is quite true that the enjoyment of the present possessor would not be impaired by the mere fact that another man had a picture like his; but it must be remembered that his interest in the picture is not all sentiment, that it is a property interest also, for which he has paid hard cash; and his enjoyment certainly would be impaired, and very seriously impaired, if, under the pressure of hard times, he put up the work for sale, and found its value reduced one-third or one-half by the fact that there was another work equally meritorious and exactly similar to be had. This is, in fact, so self-evident that it would seem unnecessary to mention it, had we not seen one or two strange imaginings of artists in regard to their rights in repeating their subjects. In regard to small preliminary studies for pictures there can, we think, be no question among fair-minded people that they are quite a separate thing from the picture, and with quite a separate kind of interest, and that their exhibition and sale by the artist, even after the sale of the principal work, is no prejudice to the possessor of the latter in any way, though some purchasers have thought so, and have been very irate about the matter, from (as we think) an entirely mistaken view as to what makes the interest and value of a first study. But for the artist to make small replicas afterwards, and exhibit and sell them as "studies" (and we know that has been done), is a proceeding quite at variance with true artistic morality. There is another point on which there is some confusion of opinion among both artists and the public. Some people seem to imagine that there can be a copyright in the idea as well as in the form of the work; and Sir Coutts Lindsay seems to have used at the Grosvenor Gallery meeting some expressions conveying that idea,* though we have no doubt he must know better than to suppose it can be literally as his (reported) words would infer. The fact that an artist has painted "King Alfred forgetting to turn the Tea-cakes" cannot prevent all the other painters in the kingdom painting the same subject, and even the same moment of action, or inaction, if they pleased; it can only prevent them from copying the face, the position, or the drawing of King Alfred, or the precise arrangement and browning of the cakes.

The question was directly raised in the process of the inquiry by the Commission whether a copyright in buildings, an architectural copyright that is to say, was a condition which it was feasible to establish. The attention of the Commission (as we might expect from its constitution) was not directed to this by their own inclination, but by the suggestion from without, on the part of the President of the Institute of Architects, who addressed a communication to the Commission requesting to be examined in regard to this subject, and who accordingly gave evidence of cases of hardship to architects arising from the reproduction of their works by other hands, and brought before the notice of the Commission a petition in regard to the subject which had been presented to the House of Lords in the year 1869. From the Report it appears (section 126) that Mr. Barry proposed that "the right to reproduce a building should be reserved to the architect for twenty years, and this whether reproduction were desired on the same scale, or on a different one, or in whole or in part, and whether by the person who gave the commission or any other." This is a very difficult subject, on account of the impossibility in many cases of really separating architectural design from questions of special convenience of plans or sanitary arrangement in regard to plan and construction; and we confess that on the face of the report it appears to us that Mr. Barry must have asked for rather more than it was possible to obtain without benefiting the individual architect at the expense of the public. We may have some remarks to make more in detail in regard to this question of architectural copyright, which hardly admits of being handled on the same ground as most of the other subjects treated of in the Report. All we will say decisively at this moment is that we certainly protest against the subject being closed against public discussion, as the language of the Report would seem to recommend: a recommendation which again lays the Commission open to the charge, in this as in some other instances we have alluded to, of endeavouring to shelve a difficult point in order to get rid of being troubled with it, instead of fully facing the difficulty, and indicating a way out of it. That architects have experienced injustice in respect to unprincipled appropriation of their ideas is unquestionable, and they have certainly a right to demand that their rights, along with those of other professions, should be publicly considered instead of being shelved *ab initio* in the comparatively secret conclave of a Commission.

One recommendation in the Report might have been looked for as a matter of course, viz., the reduction of the time of enjoyment of copyright to one term for all classes of works of art, in place of the absurd disproportion which prevails at present. In giving this recommendation decisively, the Commissioners have also shown what, in comparison with existing law, is a very commendable liberality in regard to the period of enjoyment of copyright, namely, for the life of the artist and thirty years after his death. Thus the first generation, at least, of the artist's descendants will have the pecuniary benefit of his labours. After that, as Carlyle puts it, "people may begin to steal."

Since the above was in type, we have received a "Copy of Memorial presented to Her Majesty's Government by the Royal Academy of Arts, on the subject of the Recommendations on Artistic Copyright in Paintings and Drawings contained in the Report of the Royal Commission on Copyright." The views set forth in it may be summed up as follows:—

1. The copyright in paintings and drawings to belong to the artist, but carrying no right to disturb the purchaser or owner in his possession of the picture.

2. The purchaser or owner of a picture or drawing to be protected against replicas that should so colourably imitate such picture or drawing as to reasonably allow its identity to be challenged.

*3. The commissioner of a portrait-picture to be protected against copies of any size and in any material. Also, to be protected against the publication and sale of engravings or prints of any kind, or of photographs from the said portrait.

*4. In the event of his sale of the copyright in a picture or drawing, the artist to be protected against such sale affecting detrimentally his full rights of property in all studies and sketches connected with the work in question.

*5. Sculpture, as per Royal Commissioners' report.

*6. Engravings, as per Royal Commissioners' report, but to be protected in all international conventions.

*7. Registration of paintings and drawings not to be required until the legally defined owner (the owner) parts with his copyright.

8. Registration of sculpture to be the same as in the case of paintings and drawings.

* See our condensed report on p. 150, *ante*.

* These are in accord with the recommendations of the Royal Commissioners.

A GOLD-LEAF AND GOLD-POWDER FACTORY IN FRANCE.

Among the numerous properties of gold, its ductility is foremost. In this quality no other metal known can compete with it. In fact, no other natural substance can be reduced to so thin, and yet so ungiving, a texture, though texture is, perhaps, the wrong word, when the surface produced is beaten out from a single material rather than woven from many. The French, following the ancients, have taken advantage of this scientific and artistic opportunity, in more ways than one. Their knowledge, scientific and historical, came, of course, to their help at the beginning. They learned how the antique Romans gilded with gold-leaf the approaches to their temples, and even the walls and the roofs of their private apartments. Whence arose this peculiar art and this luxurious industry? It was not all gold "leaf," however; it began with absolute plating, produced, like armour, rather by mechanical than by chemical processes, in the shielding of Pagan and heroic images. The statues of the early gods and goddesses, heroes and warriors, in Greece especially, were not gilded only on the surface; they were thick-plated with gold, though the economists of this metal were known in very early ages. Thus Nero knew the art of surface-gilding,—or his slaves knew it for him,—when he gilded the Pompeian Amphitheatre from roof to floor. We have, indeed, an account of the process by which the result was brought about, and it exhibits an amount of waste strangely in contrast with the practice of modern times. The Roman ounce of pure or solid gold gave to the hammer 750 finger-lengths square, or about half the surface accepted as an average at the present day in the most forward factories of France. This result has not been brought about, be it observed, by the assistance of machinery. Improvements there may have been in the process, but it is still by handwork that the ultimate issue is attained, and every gold-leaf in the market has sustained on an average 18,000 blows of the hammer, "delivered by hand." No steam-hammers here; no thundering masses of metal which can crush a cannon-ball or crack a nut; but still, a certain adaptation of machinery to this delicate and generally manual work. It may be interesting to note how the combination acts in the establishment, lately visited, in the Street of Cairo, at Paris. From the first moment of entry it is clear that, as at the London Mint, the very ground trodden upon is precious. It is a world of gratings and scales. On the floors channelled squares of oak, below the level of the common surface, receive the daily sweepings, which may be richer than many a Californian "find." In the centre of the building, lighted from above, is the great gold-beaters' hall, subjected to a concentrated inspection,—also from the roof,—where the hammerers are at work, and around it are little chambers, or cells, in which the final operations are carried on, in association with the manufacture of gold-beater's skin, and an apparatus for the most minute exploration of crevices. To begin with, there is an ounce of pure gold, yellow, red, or more or less pale, as may be chosen, which it is desired to spread over a space, and reduce to a thinness, so far as possible, without the risk of its being torn, or tumbling into powder. That, as every one engaged in the business knows, is the gold-beater's problem. We have only to do now with the particular processes employed in a particular French, or rather, perhaps, Parisian factory. Another essential, equally familiar, is, that the pure gold surface thus obtained shall, however attenuated, be so continuous that not a ray of natural or artificial light shall be capable of penetrating through it, any more than through a wall of masonry. It must be penetrable, again, by neither air nor damp, and if it fails in these respects it is not good gilding. These are elementary points upon which the great class engaged upon this and kindred industries need not be informed; yet they are none the less neglected, far and wide, upon that account.

The first part of the apparatus, of course, is a crucible, into which is poured the smallest possible proportion of alloy,—an excessive average producing hardness, inductility, and loss; but the poorest quality is that which is most indispensable to the gold-beater, notwithstanding that, in the French trade at all events, there are twenty degrees of purity to be dealt with, and forty "rings of quality," distinguished by experts as the "lemon," the "green," the "red," the "white," the "half-yellow," the "deep yellow," the "superfine yellow," and so forth. The character of the ingot being ascertained, it is passed under a tremendous pressure of steel and steam rollers, usually manufactured in Germany, passed again and again under increasing weights, exposed now to the coldest blasts of air, then to the intensest blasts of fire, drawn through and through, until it scarcely appears to be a substance, and so manipulated that, at last, drawn out between sheets of parchment and vellum, it has to be guarded against the chances of being blown away by a draught from the machinery. Every set of hammers is tempered to a particular quality of gold, and the division of labour, in this department of the industry, is so minute as to be with difficulty intelligible. Every operation is so small, so precise, so, as it were, dangerously delicate. Thus, at the Favrel Factory, to watch the "beating" is, in itself, an interesting spectacle, after the already thin plates, or leaves, are placed between what used to be described as the "vellum," or "sheep-skin" moulds. They are, perhaps, from 150 to 200 in number, cut in equal squares, so as to be bound up in books for use in the gilder's business, and above them the hammers work up and

down with the monotony and regularity of music. Not a stroke descends by chance or caprice; whether through habit or scientific training, the blows succeed one another in uniform succession; they are methodically distributed in numbers, weight, and direction; the hammer changes from the right to the left hand of the workers so as as to preserve a perfect equilibrium, and the Messrs. Favrel assure the world around them that this rhythmical method, so to speak, is of the highest value with reference to the general results of their manufacture. Twenty-four blows, and the "bed" is turned over; twenty-four other blows, and it is turned over again; one blow in the centre, two to the right, two to the left, and so forth, with every precaution taken, upon this tender yet unyielding anvil, against the generation of too much heat, and, consequently, the destruction of any gold. This first pounding over, the precious metal is weighed to the fraction of a carat, and now commences the process of purification.

The squares are once more reduced into minuter parts, examined, rejected, or accepted, and made to sweat under the hammer by men wearing leather aprons, to catch every atom of the dross, beaten upon ox-hides, beaten upon stones, washed with water, washed with acids, and reduced from a state of grossness to one of purity by implacable methods. The difference in the degrees of purity, thus ascertained, is marvellous. From some, the skilled workman will reject a ruinous proportion; from others, he will reject scarcely any. The refuse, as it may be termed, so far as the delicate art of gilding is involved, has to be packed in tin boxes, and sent up, certified, to the professional overseers of the works. Meanwhile, the gold-leaves become smaller and smaller, being cut up quadrilaterally at every stage, with incessant baths, pressures, and attenuations, until they are laid,—this being a secret which the French regard as sacred to themselves,—upon planks or blocks of "prick-wood," "the only wood resembling ivory, in that between its fibres there cannot be retained a particle of gold, or the hundredth part of a drop of water." The slender, flat pincers for lifting and removing them are made, also, from the same tree; but even yet the subtle processes are not at an end; they include spreading on a membrane taken from the exterior of the intestines of an ox, to which they adhere with, sometimes, an inconvenient tenacity; and still they are not completely purged of the penetrating gases which would destroy in them the elements of perfect durability. The French manufacturers confess themselves to be frequently at a loss; they fail, they say, to get the oily matter, the inequalities, the lumpiness, the air-bubbles, out of the gold, even in its most delicate and tender form of leaf, and even when the "skin" has been treated with a varnish composed of wine, spirits of wine, and essential oil of spice, beaten dry, browned in a graduated heat, hammered between folds of true silver tissue, and even supplemented by layers of gold and silver alloy. With only a proportion of experiments is success at all assured, and this, we are informed, constitutes the precariousness of the art, or the industry, call it which we will. However, the Favrel Factory may, we suppose, be regarded as, in its degree, representative, and since its order of work differs, to some extent, from those of other similar factories in Europe, it may be worth noticing. The functionary who receives from "the office" the gold in the rough, tests, weighs, and chips it, wearing a leathern apron to catch the most apparently atomic fragments, or dust,—valuable sometimes, we have already suggested, as sweepings from the Mint; that with which he is satisfied he passes on and up, through the several spheres of his department, a process which, practically, has been gone through before, but which, theoretically, must be gone over again. The ingot by this time has lost considerably in weight, though not in value, because all the value is practically preserved, and it is curious to note how, throughout the whole manufacture, the predominating idea seems to be that of guarding against waste or theft. The sweeping-brush follows the artificer everywhere, just as it does in the workshops of the diamond-cutting artificers in Amsterdam. Applications of alternate heat and cold, of soft and severe pressure, of foreign materials, including gypsum,—a process peculiar to the French, it would appear,—and of a method called "browning" (of which not the most expert gold-beater can explain the actual meaning), succeed one another in the Favrel Factory until we reach, as an addition to the well-known results, others which are not to the public at large so familiar. It is not in the form of gold leaf alone that the products of this manufacture appear. The rough powder, spread on a surface of mingled gum and honey, furnishes a material of ornament second only in magnificence to that of pure gilding itself. It supplies, moreover, the foundation of silvered and bronzed decorations, in an almost incalculable variety, and, for these purposes, is often kept in a liquid state for several months together. Still, gold leaf is, of course, the prominent and permanent object of these works, and not an ounce of the true material would be sacrificed to any other purpose unless under the most absolute necessity; or, indeed, until after the very dust of the factory had been calcined. The industry, however, is in alliance with so many others, and the French and English systems, arriving at the same result, are so much at variance, that it may have been as well to note in the history and manners, so to speak, of the manufacture abroad, certain deviations from those of the manufacture at home.

BELLS.

THE Rev. H. R. Haweis gave a lecture on this subject at last week's Friday evening meeting of the Royal Institution, the object of the lecture being manifestly to recommend to public consideration some of the views on the subject which have been the occasion of some tolerably acrimonious newspaper warfare lately. The two main points which Mr. Haweis wishes to recommend to the public mind are, apparently, first, that the accurate tuning of English bells is grossly neglected, and in consequence the "ear" of people who are in the habit of hearing them is systematically vitiated; and secondly, that the system of mere change-ringing on a limited scale of bells is a barbarism, and that the only use of bells which is worth serious attention is that which has been long practised in Belgium, and has been introduced into this country of late chiefly through the work of the well-known firm of Gillett & Bland, of Croydon,—the system, namely, of having a large number of bells forming a complete musical scale of two or three octaves, fixed in position, and capable of being played upon by the action of hammers, the movement of which is brought under the control of one performer, so that an actual performance of musical compositions in the true sense of the word is rendered possible, in place of the merely vague musical effect of change-ringing. Although the subject is rather musical than architectural, it is certain to interest so many of our readers that we may very suitably say a word as to the conclusions to be drawn from Mr. Haweis's lecture and illustrations. As some of our readers know, a good deal of the literary warfare on the subject has turned upon Mr. Haweis's recommendation of the Belgian bells as superior in tone and much more accurate in tuning than those which are usually turned out by English makers, and his statements on this head have been sharply contested and contradicted in some cases by persons necessarily having an interest in the contradiction, in some cases by those who, frankly admitting that they had no refinement of ear and no musical knowledge, nevertheless found themselves able to state positively that the English bells were as good as they could be. On this subject, most people who know anything about it know that Mr. Haweis is an authority: he is a musical amateur of considerable cultivation, and among other accomplishments is a violin-player, a matter which pre-supposes a good ear; but in any case, his specimens on the night of the lecture, if we are to suppose that they were fair and average specimens, pretty well established the fact of the superiority of the Belgian article in the matter at least of tuning, if not of tone. He had two of Van Aerschodt's bells, intended ultimately for the carillon of Cattistock Church, representing a minor third, and certainly possessing a beauty of tone and a purity of interval which we are not much accustomed to in this country. As to the bad tuning of English bells, every one who has any ear may have painful evidence daily: our biggest and most costly institution of the kind, the Westminster chimes, are hopelessly out of tune, and always have been; but no one minds it. We could have given Mr. Haweis a still more startling fact for his onslaught on English stupidity in these matters. In the parish church of Aldgate is a set of carillon chimes (mechanical chimes), by whom and how long fixed we do not know, on which the melodies of hymn-tunes are played before service on Sundays. The number of bells was, we suppose, limited by consideration of cost, the complete scale is obviously not there. One of the tunes set for the chimes is that to the well-known evening hymn, "Abide with me," &c. At the conclusion of the second line this tune modulates into the dominant, and requires a sharp fourth in the scale; but to save the expense of putting another bell this little trifle has been coolly passed over, and the second line of the tune is played with a wrong note, involving an essential grammatical alteration in the modulation; but no one minds! One may doubt whether such stupidity as this would be possible in any country but England.

So far, therefore, we are utterly with Mr. Haweis; and we draw attention to it here partly because architects who will possess themselves of such facts and understand what ought to be done and is not done may often have some influence in bringing about an improvement. But in regard to Mr. Haweis's other point, the use of bells as a musical instrument, so to speak, we are by no means so certain as to his position. In the first place, as the bells cannot be damped after being struck, there must always be an amount of jar and jangle from the simultaneous vibration of the bell last struck with that which follows it, which must very much militate against anything like clear musical definition. But a much more serious and essential objection is that such a system necessitates the fixture of the bell, in place of swinging it. Now, to our thinking, this is really taking away from the bell its essential and original character, as well as half its tone and effect. A fixed bell struck by a hammer or clapper never produces so fine a tone as a swung bell, and the very form of the bell indicates its original function as an instrument to be sounded by swinging. But, says Mr. Haweis, change-ringing is not music; and he was very satirical on the delights of ringing so many billion changes in so many years, and amused his audience very much with the subject. Well, of course, change-ringing is not music; no more is the singing of birds music, or the sound of the wind, but many people like to listen to them, even musical people.* The fact is, bell music in its ordinary form is a kind of link between nature and art, with a vague and wild beauty of its own, which nothing else resembles and nothing else can supply; and it is the kind of thing which the bell can do to perfection, and which nothing else can do. The very fact of the persistence of the vibrations after the blow adds to the effect in this case, but would certainly not do so in the use of bells for playing formal musical compositions. We have so many media of artistic musical expression of the most refined and, in some cases, perfect description, that it seems hardly worth while for people to go to great expense to put up huge imperfect bell-instruments in church-towers, which can only be played at all by so fixing the bell as to deprive it of much of its characteristic tone. The "wild bells" have their own part in the music of life, and the effort to tame them into a formal musical instrument can have only a very partial success at the best. Whether, however, we have chimes, or carillons, or change-ringing, for mercy's sake let us have the bells in tune; and if Mr. Haweis has done anything to impress the public mind with our miserable deficiences in that respect, he will have deserved the gratitude of all people with ears.

The Cost per Head and the Width of Schools.—At last week's meeting of the London School Board, a report of the Works Committee was adopted which recommended the forwarding of a letter to the Education Department, asking them to reconsider their decision to adhere to the rule of having five rows of desks in school-rooms. It was found to be almost impossible to keep the schools under 10*l.* per head, for some of the schools were now 22 ft. wide, while the space could not be economically utilised on account of there only being five rows of desks. The Board asked to be allowed to have six rows of desks.

* We certainly do remember a story of a musician who would not walk in the woods because "the birds sang so frightfully out of tune"; but this must have been a case of exceptional sensitiveness.

SOME DRAWINGS BY THE OLD MASTERS—ABROAD.

It is with more than ordinary interest that we at a distance read the description of the Winter Exhibition of Old Masters at Burlington House, this year, in the arrangement of which doubtless the new and accomplished president of the Royal Academy, in selecting from the precious mine of wealth we possess in England, has borne in mind the various collections of drawings in the museums of the Louvre, at Munich, Berlin, Dresden, at the Uffizi, the Ambrosiana at Milan, and last, not least, the collection of the "Belle Arti" in Venice, where he has passed so much well-spent time, and from the lessons of whose artists he has drawn so much of his subtle power to please.

A quarter of a century ago, a French critic, M. du Pays, remarked that the Biblioteca Ambrosiana at Milan was the only museum in Italy where were to be seen exhibited a series of original drawings by the great masters. Italy, he remarked, must be rich in such treasures, and the exhibition of these drawings might afford valuable instructive lessons. At the time, however, that M. du Pays wrote these words, the Academy of the Belle Arti at Venice was in possession, and had been since 1846, of an intensely interesting collection of original drawings.

These drawings, which, when we first saw them some twenty-five years ago, had only been recently arranged according to their respective schools and masters, in common with all original drawings by great artists possess intense interest; but an additional value is attached to them from the wealth of the collection in certain masters, as also from their being, except but to a few, almost unknown,—neglected in the glow of fame which radiates round the more familiar treasures of the Belle Arti.

It is the fate of such drawings in museums generally to receive from all but the most careful students more passing attention, rather as objects of curiosity than as works worthy of æsthetic admiration. Even in the Louvre, where the extraordinary collection is shown with such liberality, there are many drawings difficult to study with close attention; and as for the treasures of our British Museum, they seem completely shut up for the benefit of Mr. Reid and his courteous assistants. In reality, however, all drawings by great masters should be studied at least as carefully as their pictures. Original drawings are, as it were, the confidential letters written to some intimate friend, revealing even in a more open manner than written thought the true character of their author.

It is precisely because these drawings were produced when no fear of that terrible Minos, the public, was before the artist, driving from his hand and mind his individuality, uninfused by the study or the counsels of another, by the influence of prevailing tastes and fashion, that all original drawings are so intensely interesting. Whatever may be the qualities, the defects of the artist may be read with greater certainty than in the finished picture; here, in fact, we have the artist at home, not in the polished exterior which he presented to the public.

It is not more than a few moments' attention that the ordinary visitor pays to the rooms in which these treasures of the Belle Arti are preserved, but many an instructive hour might be passed with profit in the "Sala Delle Seduti," or Council Room, the walls of which they adorn.

The entrance to the collection is by the dark little passage which opens on the left-hand side of Titian's famous *Assumption*, before which the four chairs stand as they have stood for more than a generation usually occupied by some enthusiasts. A few steps and you find yourself in a somewhat darkened room, on the green covered tables of which stand the ballot-boxes of the last meeting, and on the walls the frames containing the drawings, glowing in the varied colours of their paper, enriched by the magic of time; and on one wall an Oriental porphyry vase containing the treasured right hand of Canova (*Dextera magni Canovæ*), and beneath it one of the last chisels the sculptor ever used;* several other interesting Venetian relics adorn the room; under the cornice some nineteen panels, painted by Titian in his broadest manner, representing angels' heads, and taken from the suppressed school of S. Giovanni Evangelista.

But the greatest treasures are the drawings; all those that hang in this room, as also a number of others of inferior merit in the folios of the library, were at one time in the possession of the eminent artist and author, Giuseppe Bossi;* on his death they were acquired by the Abbate Celotti, from whom, in 1822, the Emperor Francis I., of Austria, purchased them, and presented them to the Belle Arti.

Of the Venetian school there are no more than twenty-five drawings; among them some from the hands of Tintoret, one by Sebastian del Piombo, a bristling wild-boar attributed to Titian, and a pen-and-ink drawing, heightened with white, by Giorgione, of a lady presented to a knight; deprived of his extraordinary glow of colour, the faults of the painter are here apparent, his want of knowledge of drawing, and though the light and shade show masterly skill, the form is uncertain and often incorrect; a red chalk study by Paul Veronese is especially interesting; the same facility with which he painted is evident in this sketch, representing two dogs playing with a cat; it appears to have been the first idea for the dogs painted in the smaller Cena now in the Louvre (formerly in the Convento de' Servi, at Venice).

The Gian Bellini, of the head of a youth, is one of the few drawings that exist by his hand, and show the extreme care with which he worked. As a rule, he used tinted paper, on which he traced the shadows of his drawing in water-colour, then making use of the tone of the paper for the middle tints, he painted the high lights with excessive care in white; showing throughout each stage the consummate knowledge of which he was so great a master. The drawing which the Belle Arti possesses is doubly precious, as being drawn on paper prepared in the way in which Cennini, in his treatise on Painting, recommends. The drawing by Mantegna of St. Peter is of exceptional interest for its originality and beauty, notwithstanding the crudity of the artist's manner, of which Vasari speaks. All the characteristics of his pictures are evident in his drawings,—firmness, even in some cases hardness, but invariably correctness.

In drawings by Leonardo, notwithstanding the wealth of the Milan collection and of Windsor Castle, the Belle Arti is rich. One is a beautiful female head which might have been the original study for the famous Monna Lisa, and, if so, would go farther to induce one to believe that that lady was the most beautiful in the world than the present restored picture of the Louvre. One is reminded of another picture in that collection, the Holy Family, by Leonardo, in the sketch we have here, in pen and ink; there are also a sketch of a dead Christ held by a hand entwined in the hair, and a pen-and-ink drawing of the infant Christ and two profile heads. Tradition has stated these to be those of the famous Ludovico il Moro, of Milan, Leonardo's patron, and Beatrice d'Este, the ruler's wife. A sketch of a horseman appears to be the first idea of the cartoon of the Battle of Anghiari, which he painted at Florence at the time that Michelangelo painted his famous cartoon of Pisa. Several other sketches belong to the same subject, and some bear notes written in the peculiar manner in which Leonardo invariably wrote,—backwards. Other sketches represent various pieces of armour, and two horsemen tilting. As for his caricatures, which we see autotyped in many of the shops in Venice, they by no means do credit to the author of the "Cena," though the lovers of personality show with some interest one profile said to be that of Leonardo's patron, Francis I. of France. Several sketches to illustrate his friend Luca Pacioli's work on "Divine Proportion" are to be found here; among them the well-known full-length figure, which the late Mr. Joseph Bonomi has freely rendered in his valuable and not sufficiently well-known work on "Human Proportion."* The drawing by Leonardo is in pen and ink, and on it are written by his own hand the principal proportions of the various parts of the human body, the writing as usual running from right to left. Many of these drawings by the great Milanese master are well known through Bossi's work on the Cenacolo di Leonardo, published at Milan in 1810, and at a later date, in 1830, engraved by Jerli and illustrated by Vallardi, a work also published at Milan; but these now rare illustrated books have been superseded by the autotype, and reproductions of many of the treasures of the Belle Arti can be purchased for a very small sum.

To be able to thoroughly appreciate the learning of Leonardo in drawing the human figure, one must, more, probably, than in any other painter, study his pen-and-ink sketches, and those in chalk. He often worked in red chalk, and then, aided by this delicate and docile material, he modelled the lights and shadows with a grace certainly unequalled by any of his contemporaries. Michelangelo must more than once have studied the sketches of the great Milanese (for Milanese Leonardo must be said to be), for there is undoubtedly to be traced in many of his drawings, especially in pen and ink, the same manner. The drawings of Leonardo at the Belle Arti are among the most interesting of the great painter, notwithstanding the precious collections at Milan, Florence, and Windsor Castle.

We look in vain for any sketch of a horse, as a companion to the sketches which form so interesting a feature of Leonardo's drawings in this year's exhibition at Burlington House; and yet the equestrian statue for which these were made occupied the great master no less than sixteen years of trial and research. It was to have been a statue for his patron, Ludovico il Moro, to rival Donatello's Gattamelata at Padua, and his master's, Andrea del Verocchio's, noble Colleoni monument at Venice; but the unfinished model was eventually allowed to fall to wreck and ruin, a target for Louis XII.'s hired Suisses and practised marksmen.

In the drawings of the Bolognese school, the names of the Carracci, and Guido, and Guercino, naturally take their place, and with them all the characteristics of the school, the influence of former masters rather than nature in the two cousins, Ludovico and Annibale; the facility and ease of Guido, one of the few masters who has left studies the size of life (among the sketches here are some in which charcoal is used for the shadows); and the singularly characteristic manner of Barbieri, better known as Guercino,—the firmness of his work in pen and ink and want of care in defining the drapery.

The drawings of the school of Parma are deserving of mention, and a debt of gratitude should be paid to the chief of the school, Mazzuoli, better known as Parmigiano, who was the first to shake off the irksomeness of the burin, and to seek the freedom of the etching-needle, which in later days Rembrandt was to bring to such masterly perfection.

The mention of Rembrandt brings us to the one Rubens drawing of the collection, a sketch representing a Satyr placing a Cupid on a goat, and of extraordinary finish; but among the treasures of the collection are the Albert Dürers, especially one sketch of the Virgin with the infant Christ upon her knee, a drawing with all the marvellous touch and minute knowledge shown in the etched works of the master, with a greater natural degree of freedom of the pen. To thoroughly appreciate how great was the artistic learning of the Nuremberg Apelles and his technical skill, his pen-and-ink sketches must be studied with attention to see the marvel of their execution and care, their simplicity and effect. The collection also contains a drawing by Aldegrever, characterised by all the caricature of naturalism into which so many of the German sixteenth-century artists fell. Dürer's best pupil, Altdorfer, is also represented by several drawings illustrative of the Passion, all showing the minuteness of execution and taste for composition to be remarked in his works. After speaking of the nine beautiful medals, by Bartholemew Beham, unquestionably one of the finest draughtsmen of the German school, and a spirited red chalk sketch, by Snyders, of two dogs running, we return to the Italian masters, and after unwillingly dismissing a number of sketches by Lippi; two beautiful drawings by Perugino, in extraordinary preservation; a water-colour drawing of no great merit, but valuable from its interest, by Vasari; several sketches by Bramante of architectural details,

* See *Builder*, vol. xxxvi., p. 1295.

* The name of Bossi is known to the world by his "Cenacolo di Leonardo." Milano, 1810, in folio. In the letters of Paul Louis Courier, "that model of political irony and masculine style of composition," as Lord Lytton terms him, we find the following passage, written to Mdme. Dionigi, at Rome, from Milan, March, 1809:—"There is a painter here known to you, Madame. It is M. Bossi, who is at present copying for the (French) Government the famous Cena of Leonardo, an enterprise which required a man of talent. Leonardo is not to be copied by everybody; but to understand the merit of what Bossi is now doing, you must see how he has re-established in his copies the portions of the fresco destroyed by time, and which are considerable. Without him we should have had but a very imperfect idea of this superb work, of which scarcely anything remained. He has discovered, I know not where, the cartoons and studies of Leonardo, and for the colour he has availed himself of certain copies made at the time the original was entire. In short, it is a new edition of the Cena."

* Published by Roberson, in Long-acre.

among them some studies for his great work of St. Ambrose, at Milan; some eight studies from the antique, by the well-known but mediocre sculptor, and equally mediocre Florentine painter, Baccio Bandinelli; and several valuable sketches, on rose-coloured paper, by Giulio Pippi, the Giulio Romano of artistic history, which show all his bold, sure, and correct handling, and the influence of the antique, we come at last to the sketches of his master, Raffaelle, and those by Michelangelo, which, with those by Leonardo and by Dürer, form the real treasure of the Belle Arti.

Such as Raffaelle was in his pictures we find him in his sketches (of which there are no fewer than *forty-seven* in this collection). His hand runs freely over the paper, tracing his conceptions with a knowledge of proportion and correctness, and an elegance of outline and pose, in which he has remained probably unrivalled. For the most part he sketched with pen and ink, without even the necessity for the help of chalk; sometimes he tinted with bistre or other water-colour, leaving broad masses of white; but such drawings are rare, and one of them in this collection is a marvel of delicacy, nature, and expression.

To enumerate the subjects of the whole forty-seven drawings is beyond the possibilities of our space; suffice it to mention some of the more interesting, among which, a study from the famous print by Mantegna of the "Descent from the Cross," several other sketches showing still the influence of Perugia,—one, a "Virgin kneeling," taken, in fact, from the pictures at Perugia, in the Church of San Francesco; studies of drapery; a study from Signorelli; another of the angel Raphael presenting to the Virgin the lily, and showing all the young painter's grace; an exquisite drawing of a flying angel; several sketches; the first ideas for his famous Loggie at the Vatican; knights on horseback; more than one beautiful female head; a charming view of his native city, Urbino; and numerous other drawings, any single one of which would suffice to render a collection notable.

It has been said by accomplished critics that if Michelangelo had but been able to finish his works with the mastery with which he sketched either in marble or on paper, he would have been, not alone the greatest artist of modern, but of all time, and his drawings, although sketched with such rapidity, are so learnedly free that no other artist probably has ever equalled him in this quality. His outline is rapid and firm, his hand bears the freedom of his nature. He usually preferred black or red chalk. Numerous corrections may be traced in his drawings, but never any great alteration from the original conception. In his pen-and-ink drawings the outline is traced deliberately, without the aid of the chalk.

Among the eight sketches by the hand of the great author of the Sistine Chapel ceiling, apart from the value that cannot fail to be attached to his work (the Cumæan Sybil, a copy of which is at the Louvre, is one of these sketches), there are two drawings that to the English visitor appeal with more than usual interest. One is a study of the dead Christ in the arms of the Virgin,—a superb drawing in black chalk, and evidently the first study for the valuable picture by Michelangelo now in our National Gallery, and the history of whose discovery by Mr. Macpherson, in a *café*, where the panel on which the picture was painted was serving as a table, roused such interest among residents in Rome some years ago. The other is a sketch, which in the midst of the numerous other drawings, so roughly mounted, attracts attention by the care with which it has been treated, while closer inspection reveals to the attentive observer the small and familiar J. R., the stamp of the first president of our Royal Academy, and by its side the stamp he used at a later date, the SR. J. R., when the resemblance of old Jonathan Richardson's stamp induced a change. The carefully-pencilled note of some Italian collector has drawn attention to the fact of the sketch having belonged to Sir Joshua Reynolds; while an additional interest is roused when the P. L. of Sir Peter Lely is further discovered.

Treviso.

Weavers' or Carliol Tower, Newcastle. A memorial to the Lords of the Treasury in favour of the preservation of the Carliol Tower will be presented immediately by the Society for the Protection of Ancient Buildings.

ROYAL ACADEMY LECTURES ON ARCHITECTURE.*

BY PROFESSOR EDWARD M. BARRY, R.A.

ITALIAN GOTHIC, THE PRECURSOR OF THE RENAISSANCE.

IN this, and the four following lectures, I propose to consider the Renaissance in Italy, and, as a prelude to so doing, shall speak to-night of Italian Gothic as the precursor of the Renaissance. The next discourse will also deal with Italian Gothic, as employed for secular architecture.

Passing onwards, the Early Renaissance, associated with the great name of Brunelleschi, will claim our attention in the fourth lecture. The fifth will describe some of the works of the second period of the Classic Revival, and particularly those of Bramante and Sansovino; while in the last lecture of the present series I shall hope to sum up, to a certain extent, the history of the Renaissance movement as a whole, with some reference to its present, and probable future, influence on modern architecture. In so doing, the last stage of the Revival in Italy will come before us, associated with the works of Palladio and Vignola.

My last lecture was more biographical than architectural. I felt I could not do better than ask you to dwell with me, for a moment, on the memory of those whose loss is still felt within these walls. The place of our late lamented President is already filled by another accomplished artist, who enjoys the confidence of his brethren, and of the public. The exact position occupied by Sir Gilbert Scott may, perhaps, never be held again, for it was the result of that Gothic Revival to which I sought to draw your attention, and which has already, to a great extent, accomplished its task.

I now propose, in a more technical manner, to take up the thread of my previous discourses, and to renew our inquiries into that other Revival, which constitutes the rival movement, known as the Renaissance.

Those who were present last year may perhaps remember that in the introductory remarks then made, some general considerations were adverted to, in respect of the Renaissance in Italy, and its effect on English architecture, first on our Transitional styles, and afterwards, on the Classic revival of the restored Stuart *régime*.

Turning to Italy for illustrations, we found its Renaissance architecture could be roughly divided into three periods, to which might be assigned the names of the Transitional, the Roman, and the Pedantic schools.

We may now follow up the subject more in detail, and devote our attention, in the first place, to the early manifestations of the Renaissance spirit, which I have called the Transitional.

It has been said of the Renaissance that it is the movement which has brought us from true principles to false, from the architectural glories of Gothic Venetian palaces, to the bathos of Harley-street and Bloomsbury. This seems, however, a partial and strained account of the position. The deadness to artistic feeling in our architecture, which has given us our cheerless streets of the Georgian era, was due to the indifference to all schools, and not to the influence of one of them.

Our case, moreover, was peculiar, and if we turn our eyes for a moment to our nearest neighbours, the French, we shall see, that although France has adopted the Renaissance more heartily than ourselves, she has never been contented with such a transfer of the architect's mission to the bricklayer and the carpenter, as we have seen here, until very recent times.

I do not wish to extol the precise methods adopted by the French, or the detailed forms chosen by them; but if we are to refer to modern work, as illustrating the effects of the Renaissance movement, it is at least as reasonable to study the always striking, and often graceful work of French architects (previous to the Haussmann epoch), as the dingy brick walls, with square holes in them, within which our grandfathers were contented to dwell, at the pleasure of the speculative builder, who, placing his work on another man's land, not unnaturally thought more of a speedy profit, than of architectural excellence.

At the time of the first signs of the Renaissance in Italy, Gothic was beginning to exhibit symptoms of decadence, both in general forms, and in detail. To some, the first signs of novelty appear, indeed, only as corruptions of the style till now supreme. Vigour of thought was replaced by refinement of execution, and architectural ornament had become uninteresting.

The Italians had always worked on somewhat different principles from the architects of sterner climes. Southern Gothic has thus a character of its own, and was ready to lend itself to fascinations of detail. Living upon classical soil, and among the dry bones of old Classic art, the Italians were in the most favourable position possible for welcoming a change, which to them seemed but a natural return to ancient traditions. They were also far from contented with the state of affairs then existing in their midst. The new ideas brought with them something of rebellion, and constituted a protest against the austerity and dogmatic intolerance of Mediævalism.

Before proceeding with our examination of the Renaissance, it may be interesting to observe some of the peculiarities of Italian Gothic architecture, and we may then perhaps appreciate more readily the difference between the mild resistance which might be expected from it to the introduction of Classic forms, and the more uncompromising opposition of the architecture of northern Europe.

We shall find, in its examples, a spirit of horizontalism which opposes itself to the all-pervading verticality of our own Mediæval architecture. In the larger diameter of shafts, and in their frequent use as single supports, reminiscences of the columns of Greece or Rome readily suggest themselves. The pointed arch, moreover, had not only to admit a rival, but even seemed unable to hold its own. The Italians loved the round arch, while they only tolerated the pointed form. Ignoring buttresses, they tied their arches together with iron rods, and seemed to be incapable of those daring feats of construction, so familiar to the Gothic architects elsewhere.

Repose and breadth of effect had more charms for the Italian mind than the bold projections, the deep shadows, the mysterious intricacy, and the complicated details of the northern work. They had broken, indeed, with the simple lintel construction of Greece; but the arches of Rome were less easily forgotten, and their employment less readily renounced. On a former occasion I asked you to observe how far the graceful campanile of Giotto at Florence illustrates the above peculiarities of Italian Gothic principles of design. They will be the more readily understood, if you observe the contrast it presents to the towers and spires with which we are familiar in England,—as, for example, the towers of Lincoln, and the spire at Salisbury.

Without going again over the ground in respect of Giotto's beautiful work, let us examine for a few moments the great cathedral, to which it serves at once as a foil, and an appendage.

The great church of Ste. Maria dei Fiori, the Duomo of Florence, stands forth as a giant, disdaining ornament or smallness of detail. Its features are few, simple, and almost colossal in scale. The elaborate details of Giotto's tower, with the numerous parts of small dimensions, and the high finish, both of the design and its execution, bring out the hugeness of the Duomo by the force of contrast, while the tower in its turn gains somewhat in exchange.

The great church illustrates, first, the plainness and simplicity of plan on which I have before remarked. It was commenced by Arnolfo di Lapo, just before his death, which occurred about the year 1300, and we do not know for certain how far he had been enabled to carry his ideas into execution. He is usually credited with the general conception, the arrangement of the plan, and the construction or design of the vaulting, always excepting the dome, which was added long afterwards by Brunelleschi.

Arnolfo's design for covering the space now crowned by the dome is involved in mystery. It is supposed that he intended to raise his roof immediately over the piers and above the first cornice, so that the line of springing should coincide with that of the nave vaulting. He was an architect of great reputation, and was largely employed by the Florentines, some of his works still remaining as embellishments of the fair city. He united, as did most architects in those times, the practice of military engineering to that of his own art, and some portion of the outer defences of Florence were constructed by him. He designed the great municipal Palazzo

* Second lecture. See p. 140, *ante*.

dei Signori, as well as the loggia of Or' San Michele, the church of Santa Croce, and other buildings of less importance.

In the Duomo, he has bequeathed to us the largest church constructed in Italy during the Middle Ages, and we may study, with advantage, this illustration of Italian Gothic, on a grand scale.

If you desire to observe how sharply the design contrasts with Mediæval work in Northern Europe, you may place side by side with the plan of Arnolfo's Duomo, the plan of Westminster Abbey.

In the nave of the former, 250 ft. long, there are but four arches; in the latter example, we find twelve arches in a length of 233 ft. Each church is divided transversely into nave and aisles, but these three divisions occupy a space of 125 ft. in the one case, and only 75 ft. in the English example.

The upper end of both churches expands, as is usual. At Florence, we find a grand central space surmounted by a pointed dome, with three tribunes, all alike covered with semi-domes. At Westminster, there is a multiplicity and intricacy of parts, none of them presenting exactly the same effect, because planned with various angles, and much diversity of dimensions and detail. I exclude from this description all consideration of the chapel of King Henry VII., as being a later addition, not affecting the general plan of the abbey.

The Italians evidently admired the triapsidal arrangement designed by Arnolfo, for we know that it was afterwards adopted for St. Peter's, at Rome. The preference for a semicircular form as the termination of the three arms of the cross, may have been caused by reminiscences of the old basilicas. It is found in the Church of the Nativity, at Bethlehem, and was not uncommon in the early German churches. A remarkable example of this arrangement exists at Trèves, and visitors to Cologne may remember other cases, such as the Church of St. Maria in Capitolio, the Apostles' Church, and the Church of St. Martin. Those buildings illustrate the basilican arrangement of plan, which Arnolfo adopted at Florence; and apart from all questions of style, they seem to deserve the attentive study of architects who are called upon to provide interiors capable of accommodating large numbers of persons. At Westminster, and in the churches of the Middle Ages generally, large free spaces were not felt to be required. The service was, on the worshippers' part, to be an act of faith, rather than of actual participation. Long naves and aisles were needed for processions, and large choirs for the clergy. The modern English architect has other problems to solve, and may well find in some of the simpler basilican plans, models deserving his careful attention.

At Florence, the scale is too colossal to please, and has the character of a small design, unduly magnified. On entering the nave, the great arches, although well and gracefully proportioned, have a bare and unsatisfactory effect, and on passing from the nave to the central area, under the dome, this feeling is intensified. The nave should be the entrance to something grander than itself, and so indeed it is, as far as mere dimensions are concerned, for the dome is 137 ft. in diameter, and about 280 ft. high. These grand dimensions are, however, to a great extent, thrown away, by reason of the paucity of detailed parts of moderate size, to serve as a scale for the whole.

Mr. Fergusson compares the cathedral at Florence to that of Cologne, to the disadvantage of the former, as regards the effect of apparent size. The two churches cover areas not unlike, 84,802 square feet being that of the Duomo, while the German building occupies a space of about 91,000 ft.

The nave of Arnolfo is groined in a simple manner, very different to the more elaborate arrangements favoured by English architects. Like so many other parts of Italian Gothic building, the vaulting seems incomplete without painting. The designers of these structures appear, in many cases, to have regarded them rather as a framework, to be filled in by others, than as works of architecture, complete in themselves. Painting, sculpture, exquisite marble work, terra-cotta, enamels, bronze, and mosaics, were all expected to form a part of the completed design, and the architecture proper was confined within such limits as would afford due scope for these associated arts. Simple forms, spaciousness, and great wall-spaces are consequently found associated with Gothic architecture in Italy. England had a less wealth of art in general, but more skill and self-reliance among her architects. They could not count on the assistance of accessories, and relied more on themselves. In vaulting their churches they had no superiors. Being content with moderate dimensions (as at Westminster, where the nave is less than 36 ft. wide), and being, at the same time, masters of construction, they delighted in forms of roofing which became more and more elaborated, until they culminated in the method known as fan-groining, to be seen in Henry VII.'s Chapel at Westminster, and other Tudor buildings.

The Italians were well aware of the customs of the Romans. They knew that they had employed domical and barrel-vaulted roofs. The remains of the great baths which had been covered in this manner were before their eyes. It was natural, therefore, for them to adopt large dimensions with the simple vaultings of the dome and its kindred forms. For decoration they relied on the painter, in marked contrast with their Northern brethren, who, revelling in clustered shafts, large traceries, elaborate arcades, and deeply-cut mouldings, left but little to be added to their work, which was penetrated by a predominant and all-pervading architectural idea. The Northern architects, in their power of construction, were the engineers of their day, as well as artists in design. Employing buttresses, of whatever form might be best constructionally, they were always advancing in the science of building, and their work has never been surpassed in this respect, although the use of faulty materials, and the neglect occasionally to secure stable foundations, has imposed on their successors the necessity for extensive works of reparation.

The Italians shunned buttresses. We look for them, in vain, in Arnolfo's church, or in Giotto's tower. At the Duomo, around the upper arms of the cross, strength is obtained, less scientifically, by an enormous thickness of wall. Elsewhere, resort was had, without reluctance, to iron ties to keep the arches from thrusting out the walls. With their love for repose, and breadth of effect (both of them most admirable qualities in themselves, when rightly understood and employed), the Gothic architects of Italy preferred a plain wall, as at Florence, to the varied surface, familiar to ourselves, at Westminster and elsewhere, with its variety of light and shade, and its picturesqueness of outline, both of plan and elevation. They did not, indeed, wish their walls to be undecorated. They were ready to cover them with marbles, arranged in panels, and to crown them with cornices of great elaboration. Here we may see evidence of that reliance on others, to which reference has just now been made. Such veneering with marble as exists at the Florentine cathedral has nothing to do with the architecture. It indicates no construction, and might have been applied by any one, and at any time. It serves to give some scale to the building, and to this extent is valuable; but it appears rather as an independent attempt at decoration than as an architectural design successfully achieved. There is a weakness in these veneering efforts at ornamentation, which brings into strong relief the more manly, self-sufficient vigour of the purer Gothic styles, in other countries.

Italian Gothic must, indeed, be rather regarded as an incomplete style, not fully worked out, than as a perfect system, able to compete on equal terms with Mediæval work abroad.

Whether we regard the general principles of composition, or the detailed forms adopted in Italy, we come everywhere upon traces of Classicalism, which seemed to herald the Renaissance. A few slight changes in the Duomo at Florence, with the substitution of a barrel-vault for the groined roof over the nave, would give us a building that might compare with the old Roman work, such as the Baths of Caracalla, or the Temple of Peace.

In detail, the elaboration of the ornaments which were added to the simple constructional forms, together with the beauty of execution lavished on individual parts, were but little affected by the Renaissance, which, impatient of control, wished to see each artist in his own special work, rather than recognise its value as part of one great conception, impressed with a single over-ruling thought.

If we turn from general principles, to the consideration of special details, we shall find in them also remains of Classic custom. Instead of the clustered shaft, so beautiful and varied in its design, as we see it in our great churches, we have, as I have already said, the single column, recalling those of Greece and Rome. The use of the single shaft is common in Italy, not only in arcades, but as mullions for windows, and, in such cases, they are often doubled on plan, with a happy effect. The abacus is almost always square, as is the lowest member of the base,—facts strongly suggestive of a Classic origin. The same may be said of a diminution in diameter from the base to the capital, which is occasionally the case with Italian Gothic columns. In English Gothic, such diminution is almost unknown, excepting some instances of Norman work, due doubtless to a Romanesque influence.

In other details of Italian Gothic, we may see further signs of attempted fusion, as in the plain archivolts, with square edges, when an English or French architect would have had a cluster of mouldings, with round beads, and alternate hollows, coming down upon a circular capital. The cornices, again, forming strong horizontal lines round the building, are evidently derived from the olden architecture.

The abacus of the column is in direct relation with the archivolt which it supports. A Roman archivolt with its outside moulding, and the square edge inside, required a square capital beneath it, on which to rest. The groups of mouldings which we see in our own cathedrals as naturally call for a circular capital, and spring easily from a round or octagonal abacus. The octagonal capital is not unknown in Italy, but it is rare, while the square form is the all but universal rule.

The Greek method of covering the spaces between the columns by a massive lintel of rectangular section, required a square surface on which to rest, and, consequently, although the columns were circular on plan, the upper member of the capital was either square, or of a form allied to the square. In the Grecian Doric, the moulded part of the capital was circular, while the uppermost member only was square on plan. The Ionic had also originally a square abacus, and the Corinthian order alone adopted a curved form. The latter, indeed, was little different from a square, having the sides slightly curved, with a give-and-take line. In all these cases, the square abacus formed a sort of cushion, or template, on which to rest the beam of stone or lintel, the support of which was the *raison d'être* of the columns.

The square abacus, adopted from Classic times, has never disappeared from Italy, and is constantly used in Italian Gothic. We find it here also, as you are aware, in the Early Gothic, which was more or less drawn from Romanesque and Byzantine types. In the best ages of English Mediæval work, however, the circular form was almost exclusively used, until, in the latest styles, the abacus became octagonal, as you may see in many Perpendicular examples. By this time the abacus had lost its distinctive character, and had become mixed up with the rest of the mouldings, which sometimes also followed the octagonal type, the more common design, however, being a mixture of mouldings, circular on plan, with an octagonal abacus, the transition from one form to the other being skilfully managed by the interposition of a large hollow.

The Italian Gothic architects, building, as they did, in an arched style, had not exactly the same reason as the Greeks for providing a square surface on the upper part of the capitals, but they needed such an arrangement almost as much from the section of their arches. These were, for the most part, plain, or very simply moulded, with a considerable thickness of square reveal or soffite. The section of such arches at the point of springing, immediately over the capital, was square, and thus a square abacus was the most convenient, and the best constructional form. In the classical column, the abacus was a plate, or bearing surface, interposed between the weight above and the supporting column below, the diameter of which was equal, or nearly equal, to the width of the stone lintel or beam, which it carried. The Byzantine and Gothic capital was differently treated, and acted as a direct transmitter of strain to the column, which was much less in diameter than the superincumbent weight. The column had thus lost importance of dimension; but such loss was compensated by the practice of placing one column behind another, in arcades. In such cases, a common abacus often united the two capitals, as may be seen in the cloister arcades of San Zenone, Verona, where, moreover, the

wall above the columns is further thickened out by means of corbels. The bases of these columns are united, as well as the capitals, and like them they have also a square, or rather rectangular, member. The base mouldings are an evident reproduction of the Attic base, with all its members and peculiarities. The lower plinth, square or rectangular on plan, served the same purpose as the abacus of the capital, as a transmitter and distributor of pressure.

The arch mouldings were, as we have seen, such as seemed to be specially suitable to a square abacus. When the arch was not actually square in section, a few indentations, with the occasional interposition of large beads, filled the place of the smaller beads, fillets, chamfers, and hollows, of English Gothic. In their fondness of plain surfaces, and dislike to bold projections, the Italian architects may be said to have designed their buildings as elevations, while our own Mediæval architects thought theirs out in perspective. Much of the difference may be due to climate, as, under an Italian sun, the deep shadows of Northern Gothic might have seemed exaggerated. The same influence told doubtless on the wall decoration, which was noticed just now, as applied to the Duomo at Florence. Deeply moulded arches were obviously unsuited for marble, a material in which the Italian architects were permitted to rejoice. The real construction was often veiled, and the forms of the mouldings dictated by the necessity of upholding thin veneers of costly marble, forming a system of decoration applied superficially to the actual structure. In spite of all care to the contrary, it is impossible to prevent these slabs of encrusted marble from cracking, or bulging, as unforeseen pressure comes upon them, by the settling of the building or otherwise; and when this is the case, all sense of permanent security vanishes, and with it, all enjoyment. The introduction of marble in panels, recesses, or spandrels, is not liable to this objection, but when such decoration is used externally, it will be generally found that the English manner of preferring ornament of a more solid character, such as carving can give us, is likely to produce a superior effect. The panelling on the outside of the cathedral at Florence recalls the work of the cabinet-maker, rather than that of the architect.

The building is, however, incomplete, and if the entrance-front had been finished, as designed by the architect, the whole effect of the exterior would no doubt have been more pleasing. We do not, indeed, know how Arnolfo would have treated his façade, but in Siena Cathedral an example exists, very rare in Italy, of a front entirely finished. In this case, we have an elevation of great richness and much beauty of detail. It is, however, an application to the building a veneer on a large scale, for the outline bears but an imperfect reference to the constructional form of the building within. Gables appear for ornament, without roofs behind them, and the aims of the designer would seem to have been akin to that of the scenic artist, who presents us with a frontispiece, and does not allow us to turn the corner, or view it, save from one point. The interior of Siena Cathedral is certainly one of the most charming of Italian Gothic churches, not, indeed, so much for its architecture, strictly so called, as for the exceeding beauty of detail of the accessories thereto. The strongly-marked banding of various coloured marbles in its walls is, indeed, monotonous, and to my thinking inharmonious with the vertical principles of Pointed architecture, but the whole interior glows with gorgeous colour. We have exquisite carvings, as in the pulpit, so well known, probably, to most of you, elaborately inlaid woodwork, paving of splendid design and execution, bronze and ironwork, gilding, and coloured marbles in profusion. The architect has provided an arena within which art of every kind has seemed to revel. The details are everything, and the general architectural idea is smothered by those who should have been its servants. It was probably of such a building that the Florentines were thinking when they instructed Arnolfo to build for them a cathedral, which should exceed in beauty all previously-existing structures, and should exhibit a "style of magnificence which neither the industry nor the power of man can surpass." Arnolfo did not live to carry out this grand commission, and it is strange that we are left so much in the dark as to his ultimate intentions, if, as Vasari tells us, he had a wooden model prepared of his completed design, which model was afterwards lost through the carelessness of his successors.

In further comparing Italian with Northern Gothic, we cannot but notice the difference in the windows, not only as regards their relative frequency and size, but also their architectual character. In the great Northern churches the architects delighted in large and elaborate windows. In Italy they were few and far between. The brightness of the sunny South taught its builders to exclude light and glare, and the use of coloured glass was not encouraged. It may be doubted, indeed, if such use would have been consistent with the methods of internal decoration, common in Italy. Great spaces of wall, covered with fresco painting, might not unreasonably be thought inimical to the adoption of painted glass, through which a bright light would cast hues of undisguised variety on the carefully-studied harmonies of the painter. In England, and still more in France, the introduction of stained glass affected the design of churches to an enormous extent. If we had not the wall polychromy of the Italians, our architects were no less fond of colour, and they found in large traceried windows generally, and often exaggerated clearstories in particular, a field for the application of colour on a large scale. That with which the Italians covered their walls, their Northern contemporaries placed in their windows.

The same feeling appears in the tracery. In Italian churches, there is generally little of it to be seen, and where it exists, it is far inferior to that to which we are accustomed in this country. The tracery of Italy, with its heavy intervals between the openings, seemed designed, as no doubt it often was, to exclude light, and thus the very reason for the existence of the window was lost. The lack of an adequate clearstory, partly from reasons of climate, and partly from the views adopted by Italian architects, is, to a Northern eye, a notable defect in their churches. The pleasing gradation of height, from aisle to nave, to which we are accustomed, is absent, and in its place there is heaviness and want of variety.

Of late years, so much attention has been given to Italian Gothic architecture that many of our architects have adopted details taken from it into their own designs, which had been previously based upon the purer styles, familiar to them in their own country. In this way, a cosmopolitan character has been impressed upon certain works, and although there are those who condemn such a process on principle, I cannot see any reason for such condemnation, apart from the special circumstances of each case. We are entitled to regard our art as a whole, and its history lies open before us. If we are of opinion that certain forms with which our ancestors were unacquainted, but which are known to us, are good in themselves, there can be no valid reason why we should refuse to avail ourselves of them in our work of to-day. Students must bear in mind, however, that to do this well, and reasonably, is a matter of no small difficulty. They must not expect to avoid the reproach of incongruity by pointing to their sketch-books, and giving the name and date of every detail. The essential quality of all true art is its fitness, and in adopting Southern detail into Northern work, the presumption is against the process. We should, therefore, be very sure that in attempting fusion we are not sacrificing principles, or offending common-sense. With this proviso, the lessons of Italian Gothic are before us, and may, in certain cases, be followed with advantage.

In illustration of my meaning, I may perhaps recall to your memory the description of the Italian capital, with its square abacus. This form is appropriate, when used, as it was in Italy, to support arches with flat soffites, or with simple mouldings, not much differing from a square on section. It is quite otherwise, however, when the Italian capital is used beneath a group of deeply-cut English mouldings, bringing the soffite of the arch to a more or less narrow fillet. In such cases, the square abacus ceases to be reasonable, and, according to the law of common sense in architecture, it fails to please. The corners of the capital appear isolated, overhanging, and heavy, and we miss the simple gracefulness of the English jamb or mullion, with the mouldings naturally continued, or varied by the use of an attached shaft, of dimensions not greatly in excess of the mouldings, of which it seems to be a part.

One inducement to adopt the architectural details of North Italy has arisen in consequence of our habitual employment of brickwork. In this country, from the difficulty, in many parts, of procuring stone, and from the increased cost of building, the necessity for economy meets the modern architect at every turn, and imposes upon him limits which he cannot disregard. Large churches are often necessary, where the poverty of the neighbourhood renders it impossible to employ costly stonework for construction. Brick has, therefore, of necessity become the common building material, and a style of architecture which seems to lend itself readily to the use of brickwork has obvious claims on our attention. In the plain jambs, the simple mouldings, the geometrically enriched cornices, and string-courses of North Italy, we have features which are specially appropriate to brick architecture, while by the employment of the column, the use of numerous small pieces in the mullions of the windows is avoided, a defect which appears very clearly in the brick Gothic architecture of Northern Europe. The adoption of terra-cotta, again, has proved an argument in favour of Italian types. You are aware how splendidly the use of this material is exemplified in such Italian buildings as the great Hospital at Milan. In England, apart from a few exceptional instances, terra-cotta has held an inferior place, but there can be no doubt that it offers great opportunities to the architect of taste and judgment. I have in a former lecture attempted to point out to you the limits within which, as it seems to me, terra-cotta can be properly applied, and these may be broadly defined as ornamental, rather than constructional, for which latter purpose stone, and in default of stone, brick, must be considered the preferable material.

In using brick for buildings, in our large towns, we must always bear in mind the changes of our climate, and the consequent dinginess which, sooner or later, settles on brickwork, and obliterates distinctions of colour. We are often very hard on our immediate predecessors who covered their brickwork with stucco, but we may remember that their buildings, at any rate, admit of being cleaned, so as to afford some cheerfulness to our streets. Architects may, perhaps, consider whether they have not been too indiscriminate in their denunciations of plaster. For interiors, at any rate, it has many advantages, and is often to be preferred to the rude brickwork, not too good, either in quality or workmanship, which we are asked to accept in exchange. No one would desire to use cement dressings and cornices if he could do better, but for coating plain walls plaster will act as a protecting covering, giving both warmth and dryness. There should be some place in our work for methods of building which possess these advantages, and the question arises when and how plaster may be legitimately used. It would not appear that the Italian Gothic architects had much affection for brick surfaces in themselves, being always ready, as we have seen, to cover their walls with veneers of marble, according to the means at their disposal. This was, of course, an application of a covering more foreign to the structure of the walls so treated, than cement or plaster. The truth is, it is impossible to lay down absolute rules in such matters. Architecture should satisfy the reason, and should please the taste; and all the arguments in the world will not make a man like that which his soul abhors. We can but point to matters which appear worthy of your attention. The further study and the decision how to use your knowledge must rest with yourselves. The danger of being led to substitute hasty catchwords for thoughtful decisions is always great to the inexperienced, and the views on our art which are constantly put forth are varied enough to account for much confusion of ideas.

The charms of Italian Gothic Art have perhaps led some of us to stray too readily from English traditions. Great caution will always be needed in adopting foreign customs, and we must be sure that in so doing we are borrowing from the rich to lend to the poor. Can this be said of Italian Gothic, when we think of the wealth of resources of all kinds in our old English architecture? The great architect who has lately passed away from us was slow to answer this question in the affirmative, and his example enforces the lesson of caution I have ventured to suggest. In the meantime, rejoice in the opportunities you enjoy of investigation of the work of your predecessors in every land, opportunities which, until lately, were beyond

the reach of all but a few of Fortune's favourites; but while you are studying the art of other times and nations, do not forget the dictates of common sense, or the needs of your own age and country.

THE CONNEXION BETWEEN ANCIENT ART AND THE ANCIENT GEOMETRY, AS ILLUSTRATED BY THE WORKS OF THE AGE OF PERICLES.*

I must ask your indulgence while I endeavour to bring to your notice some of the connecting links that formerly existed between ancient art and Greek geometry; and although I believe the subject to be capable of clear demonstration, as every Greek marble fragment bears testimony to the fact of such connexion, yet I should not presume to bring my own researches to the notice of the Royal Institute of British Architects in a written paper had I not been invited to endeavour to place before you in a simple form a few of the results of the calculations which have been stated in a work which I have published, entitled, "The Geometry and Optics of Ancient Architecture," and to prove by evidence, that the statements made therein are correct, and that complete harmony exists between the few passages in the writings of Plato, of Aristotle, of Vitruvius, of Philo, and of other authorities which refer to the theory of ancient art, and the facts that can be deduced by measurement from the architectural remains in the Athenian Acropolis, which were calculated and executed by the architects of the age of Pericles.

The subject of the work I refer to is confined entirely to ancient architecture, and closes with the Christian era, so that it in no degree touches upon the questions of modern architecture, in which all the requirements are different, but it is simply an attempt to interpret some of the art problems, which the Greek architects have left engraved in mathematical lines upon every marble fragment of the Parthenon, of the Propylæa, and of other designs; and I have done this in the same spirit that we are trying, from the hieroglyphics and from the arrow-headed characters, to restore the languages and the literature of Egypt and of Assyria, without any expectation of introducing into Europe the civilisation of those ancient empires.

We must, therefore, dismiss from our minds all ideas of reviving Greek architecture in its original form, and must simply look upon the Greek temples as ancient works of art, in the same manner that we consider the philosophy of Plato and of Aristotle, or the geometry of Euclid, as a kind of ancient foundation upon which modern thought can rest and expand; yet possibly in Greek art, after it has been winnowed of all that is inapplicable to modern times, some ideas may be found to remain that could in themselves be made to apply to the art of all ages.

EGYPTIAN ARCHITECTURE.

The subject we have now to consider naturally commences with Egypt, where Aristotle informs us "that the mathematics were born, because the priests there enjoyed the privilege of being detached from the affairs of life, and had leisure to devote themselves to study," and the evidence is, I believe, sufficient to prove that the mathematics were not only born, but were cultivated in Egypt with considerable success, or the Greeks would not have studied in the Egyptian universities, neither should we have preserved to us in the British Museum a papyrus treating of the Egyptian geometry and arithmetic; but the existing Egyptian monuments when examined will, I believe, also confirm the early traditions of the Greeks, both as to the origin of the geometry and of the arts of Greece.

In the temples and in the tombs at Thebes are to be found some early and simple ideas of proportion, so far as the making of lines commensurable one with another, with the selecting of such combinations as produced harmony in the proportions; and in the horizontal lines, in the outlines of the shafts of the columns, in the curved sections through the cornices, and in the vaulted ceilings in the tombs, we have certainly varieties of curves traced with mathematical care. But to these I shall again refer, and for the present I will confine your attention to the first given proportions of the Egyptian sculpture and architecture.

In the works of Monsieur Prisse d'Avennes and Herr Lepsius, several examples are given of certain canons of proportion for the human figure which were adopted by the Egyptians for designing their sculpture. The example I have selected (plate 1, fig. 1) divides the whole height of a man into nineteen parts, making the head = 3 parts, the foot = 3 parts, &c., and it is simply from the fact that certain canons of proportion were selected for the human figure that I now refer to the length, the width, and the height in the principal chambers in the tombs of the kings at Thebes, or, rather, in the excavated palaces, which are also generally proportioned in aliquot parts, and executed and finished in the most elaborate manner, thus taking fig. 2, plate 1, the principal chamber in the Tomb of Sethee I,—the length = 18 parts, the width = 11 parts, and the height = 11 parts.

Fig. 3, plate 1, is a plan and section of another of these excavated chambers. This example does not divide into the usual aliquot parts, but the length, the width, and the height of the chamber can be expressed by the 11th prob. Euclid, book 2. I simply give the measurement.

Fig. 5 shows the columns and the entablatures of the inner and the outer courts of the temple at Medinet Haboo. These are also executed in aliquot parts:—

	Whole height.	Column.	Entablature.
Inner court ...	14 parts ...	11 parts ...	3 parts
Outer court ...	13 „ ...	10 „ ...	3 „

In all this there is very little more than those ideas of natural proportion that may be found in many works of architecture, and which might be illustrated from the cathedrals of Europe, as well as from the tombs and the temple of Egypt; but there is a tendency in both Egyptian and in Greek architecture to make the lines commensurable one with another, and to avoid as much as possible incommensurable lines and angles. But I need not dwell longer upon Egypt, for as Egypt declined, other schools of geometry and of art were destined to rise in succession into importance.

Thales, B.C. 640, after studying in Egypt became the founder at Miletus of the Ionian School of Philosophy, in which was cultivated, earlier than in other parts of Greece, every branch of the mathematics and of the geometry that we now find to have been applied to ancient architecture.

Among the list of those distinguished in science who studied at Miletus we meet with Pythagoras, the founder of the School of Philosophy in Magna Græcia, B.C. 590, and with Anaxagoras, B.C. 480, the friend and instructor of Pericles, and one of the first geometricians who settled in Athens, and there founded the Athenian school of art and science. We thus perceive that from the earliest period of history until the final conquest of Egypt by the Persians under Cambyses, in B.C. 525, the arts and science were cultivated with success by the Egyptian priests, and that the Greeks looked to them as their instructors in geometry and in architecture; after that, for a short time, the sciences were cultivated in Ionia, when a second Persian invasion under Xerxes, B.C. 480, caused nearly all the cities and temples in Ionia to be destroyed, as well as the temples in the Acropolis of Athens. Ultimately, by the energy of the Athenians, Xerxes was defeated at the battles of Marathon and Salamis, and finally forced back from the shores of Europe; Athens at once became the leading power among the states of Greece. Then upon the ruins of the early Temples in the Acropolis of Athens, were erected the present works of Greek art, and to this school of geometry, of sculpture, and of architecture I must now direct your attention, commencing with the Greek theory of proportion.

GREEK ARCHITECTURE.

The first given Proportions of the Athenian Porticos.—Plato, in his "Timæus," says:—"The composition of the world received one whole of each of these four natures,—fire and air, earth and water; for its composing artificer constituted it from all fire, water, air and earth, for he concluded it would thus be a perfect whole if formed from perfect parts."

This harmony of proportion, which the geometricians discovered in the forms they investigated, and which the philosophers conceived as existing in the composition of the world, the ancient architects established as a fundamental principle in their architecture. Thus Vitruvius says:—"The composition of temples is governed by the laws of symmetry, which an architect ought well to understand: this arises from proportion. Proportion is the correspondence of the measures of all the parts of a work and of the whole configuration, from which correspondence symmetry is produced; for a building cannot be well composed without the rules of symmetry and proportion, nor unless the members, as in a well-formed human body, have a perfect agreement."

The information to be derived from ancient sources, except from the actual remains of Greek architecture, is slight; but the works of the age of Pericles were executed with such extreme precision that we are able from them inductively to recover the original canon of proportions of the Athenian porticos; and this we can do by simply eliminating the small irrational quantities that by measurement are found to exist in the whole height of each temple and in the heights of the steps, the columns, and the entablatures, when compared with the length of the upper step in any given portico, and of substituting instead the nearest commensurable magnitudes. These small irrational quantities are found to vary between zero and a few inches in the porticos of the Parthenon, of the Propylæa, of the Erechtheium, &c., and are the result of careful calculations to be hereafter explained; but when they are effaced, then all the Greek porticos harmonise, and can be given in a simple diagram, which is really the given Athenian canon of proportion of the Greek porticos. With these given quantities there is no difficulty in arriving by calculation at the true executed dimensions in every example, and the variations between the first given quantities and the calculated executed dimensions are the additions and dimensions referred to by Plato, by Aristotle, and by Vitruvius.

As to the Canon of Proportion of the Athenian Porticos. Divide the line A D into twenty-four parts, and let the length of the upper step of the

Octastyle	Hexastyle	Tetrastyle, porticos be
= 10 parts	= 8 parts	= 6 parts.

Let the whole height of the Doric porticos = 5 parts. Let the whole height of the Ionic porticos = 6 parts.

In the Doric porticos the whole height is found to divide into nine aliquot parts:—

The height of the steps	= 1 part.	
„ column	= 6	„
„ entablature	= 2	„
	= 9	„

In the Ionic porticos the whole height is found to divide into twelve aliquot parts:—

The height of the steps	= 1 part.	
„ column	= 9	„
„ entablature	= 2	„
	= 12	„

These proportions of the porticos are simply the first given quantities, and they are explained more in detail in my book.*

The Projections.—In the Doric and Ionic porticos, the total horizontal projection from the friese to the lower step is made equal to 1-9th of the whole given height of the porticos; then for the details of the steps, of the entablature, and of the inclination inwards of the first masses, the whole projection is divided into some given number of aliquot parts,—as, for example, in the Parthenon, seventeen parts; in the Propylæa, sixteen parts; in the Erectheium, twenty-four parts; and the details of the projections are regulated by these numbers. These horizontal dimensions undergo no corrections, but are executed as they are first given. The working out of these first-given proportions of the porticos was evidently the result of study and careful observation. But to attempt to explain the reason why certain proportions should produce that agreeable impression on the eye which by universal consent they were acknowledged to do, is, I feel, impossible. In music we can give no reason why certain harmonies and scales should produce an agreeable impression on the ear, or why many other intervals that might be selected would be discordant,—as Aristotle says, "Posterior Analytics," chap. 3:—"Neither is all science demonstrative; but the science of things immediate is indemonstrable." But I must leave these questions, and proceed to the consideration of the important subject of Position, which

* By Mr. John Pennethorne; read at the Royal Institute of British Architects on the 10th inst.

* "The Geometry and Optics of Ancient Architecture," part i., plate 3.

naturally includes the points of sight and the calculations of the apparent magnitudes.

Position.—It is impossible to study the Egyptian and the Greek temples without perceiving that great care was taken by the architects in the arrangement of the position of the Propylæa, the roads of approach, and the sculpture surrounding the principal designs; thus in Egypt, both at Karnak and at Luxor, the roads of approach to those temples are marked by long lines of sphinxes, leading up to the Propylæa with their statues, flags, and obelisks, marking the entrance to the temple or the palace, and the spectator was led to approach these designs from certain pre-determined positions. In the Egyptian examples, the Propylæa and roads of approach are placed centrally, and the spectator enters at once into the inner courts and halls of the temple, which are enriched with columns, statues, and paintings. The design is arranged more for internal than external effect.

The Grecian temples were generally surrounded by external colonnades, supporting an entablature enriched with sculpture, both in the frieze, and in the pediments; and the external appearance of the design was carefully studied.

This change in the arrangement of the designs between Egypt and Greece led to a corresponding change in the position of the Propylæa and roads of approach to the several temples, which instead of being central, as we have seen was the case in Egypt, were in Greece planned so as to offer an angular view of the temple to the eye of the spectator. Thus Colonel Leake, in the "Topography of Athens" (page 516), when speaking of the Olympium at Athens, says:—"The approach to it, as in the instance of the Parthenon, was from the west. The gate of Hadrian formed an entrance to the peribolus at the north-western angle, and presented to the spectator the same kind of view that he obtained of the Parthenon on emerging from the Propylæa. In both instances his eye, by comprehending at once a view of one of the fronts and one of the sides of the building, enjoyed a more imposing prospect of those magnificent edifices than could have been presented to him by an approach immediately in front. There was a similar approach to the Temples of Minerva at Sunium and Priene, and at the Panhellenium of Ægina."

The Plan of the Acropolis of Athens.—The relative positions of the Propylæa, of the Parthenon, and of the Erechtheium were the same in the old plan of the Acropolis, before the temples were destroyed by the Persians, as in the restored plan, when the edifices were rebuilt under the administration of Pericles. The Greeks, whenever it was possible, from the earliest period always endeavoured, by the arrangement of the gateways, the roads, the sculpture, and the artificial platforms, to present each design to the eye of the spectator so that it might be seen from a favourable angular point of view.

From its position, the Propylæa to the Acropolis at Athens was an exception to this rule, and the west portion of the vestibule could only be seen from, and was calculated for, a central point of view; but, passing through the vestibule of the Propylæa, the first important monument that presented itself was the statue of Minerva Promachus, by Phidias, which was 70 ft. high, including the pedestal. This statue was placed nearly in a line with the centre of the east portico of the Propylæa, and 120 ft. in front of it, and the pedestal presented an angular view to the eye of the spectator; near the base of this statue we obtain an uninterrupted angular view of the Parthenon, embracing the west portico and the north return side, and on the platform at the east end, and near the south fortification wall,—where, according to Pausanias, were represented the wars of the giants, the battle of the Athenians with the Amazons, and the battle of Marathon,—there is a second angular view embracing the east portico and the south return side.

Similarly, the plan shows sufficient space to allow of angular points of view, both for the east and north porticos of the Erechtheium.

The facts relating to the canons of proportion of the several porticos,—to the setting out of the projections, and to the arrangement of the relative positions of the temple with regard to the Propylæa and sculpture to suit certain favourable angular points of view,—can all be derived from direct observations, but we have now to consider the subject of the given points of sight,—the apparent magnitudes, and the calculations that were made by the Greek architects in order that the designs should appear to the spectators to be as perfect in apparent proportions as they were first conceived in the mind of the architect.

The Points of Sight and the Apparent Proportions.—The subject of the apparent proportions was certainly considered anciently as an important part of Greek architecture, but each step in the calculations must, I feel, be clearly proved before the theory will be received as true.

The idea of a point of sight is not new, but that the Greeks should have corrected all the apparent vertical magnitudes, so that in the finished design they should all be commensurable one with another and with the apparent whole height, and then have trigonometrically calculated and corrected all the executed heights in the finished design to suit a favourable given point of view, requires actual proof. The evidence for what is stated will be based:—

Firstly. Upon the written statements of Plato, of Aristotle, and of Vitruvius, who all clearly refer to a favourable point of view, to the apparent magnitudes, and to the corrections made in the original design by certain "additions and diminutions."

Secondly. The measurements of the Athenian porticos show clearly that certain small plus and minus quantities have been either added to, or taken from the original dimensions of the porticos, as given in the canon of proportion.

Thirdly. By simple trigonometrical calculations commencing with the given quantities we must arrive at the true executed dimensions, which will be found in every case to agree with the measurements.

1. Plato, in the "Sophist,"* says:—

"*Guest.*—I now seem to see two kinds of imitative art. I see that one is the assimilative art,—and this especially takes place when an artist, according to the proportions of the original in length, breadth, and depth, and, moreover, by adding fitting colours, works out the production of an imitation. [This is the case in the Egyptian tombs.]

Theæ.—What, then, do not all artists endeavour to do this?

Guest.—Not such as mould or paint any great work. For if they should give the true proportion of beautiful things, you know that the upper parts would appear smaller than is fitting, and the lower parts larger, through the former being seen by us at a distance, and the latter close at hand.

Theæ.—Entirely so.

Guest.—Do not, then, the artists bidding farewell to truth, now work out not real proportions, but such as seem to be beautiful in their representations [namely, apparent proportions]?

Theæ.—Entirely so.

Guest.—Is it not, then, just, as being at least probable, to call one an image?

Theæ.—Yes.

Guest.—And we must call the part of the imitative art subsequent to this, as we have said above, assimilative.

Theæ.—We must so call it.

Guest.—But what shall we call that which appears, indeed, similar to the beautiful, through *the view taken from a favourable point*, but which, when seen by him who has the power to look on things sufficiently, is not like that to which it professes to be like? Must we not call it an appearance, since it appears to be, but is not like?

Theæ.—Undoubtedly.

Guest.—Is not this part abundantly to be found in painting, and in the whole of the imitative art?"

Aristotle defines the beautiful to consist in magnitude and in order; magnitude, being a relative term, is made to comprise the whole "extent of that scale which the *eye* is able *to embrace at one view.*" Again, in the Nicomachean Ethics, book ii., chap. 1, he says:—"Every scientific man will avoid excess and defect, whence it is usual to say of works that are well finished that nothing can be *added or taken away from them*: acknowledging by this that *excess and defect* corrupt that which is excellent in them." In the Parthenon and in other designs seen from the angular points of view, the diagonal line traced upon the plan of the temple is the line of greatest extent which the eye is able to embrace at one view; in the monument of Lysicrates, and in the case of the statue of Minerva Promachus, the whole height becomes the line of greatest extent. Vitruvius enters more into detail, and refers more especially to architecture.

He says, in book vi., chap. 2:—"After having determined upon such proportions as the necessity for the commensuration of the parts with the entire building seems to require, the greatest judgment must be exercised in—

'Adapting them to the nature of the spot' [position],

'The use to which the edifices are designed,'

'The appearance they ought to assume,'

by making such *additions* or *diminutions* that although the proportions are not strictly what they ought to be, the eye may not be conscious wherein they fail."

"Under every peculiar circumstance, great judgment is necessary in *calculating* the effect that will ultimately be produced."

"Since, therefore, objects sometimes assume an appearance of being otherwise than they really are, it will not be denied that additions and diminutions may be made, as the nature of the situation, or the exigencies of particular occasions require, in such a manner that the deviation from the general laws of proportion will not be perceptible."

"It therefore becomes necessary, in the first place, to institute *laws of proportion*, upon *which all our calculations must be founded.*"

"According to these, the ground-plan, exhibiting the length and breadth of the whole work, and the several parts of it, must be formed."

"When the magnitude of these is once determined, the parts must be arranged so as to produce that external beauty which suffers no doubt to arise in the minds of those who examine it to the want of proportion in any part."

"The mode of the symmetry, therefore, being first fixed" (that is, the first lines of the design being traced commensurable one with another), "the alterations" (namely, the diminutions and additions) "are to be made thereon."

Book iii., chap. 2.—"Beauty being the province of the eye, which if not satisfied by the due proportion and augmentation of the members—correcting apparent deficiencies with proper additions—the aspect will appear coarse and displeasing."

Thus we find both Plato, Aristotle, and Vitruvius agree in stating that when large works of art, either of sculpture or of architecture, were designed to be "viewed from favourable points of view," the first given proportions of the design were changed by "additions and diminutions" being made, so that in the finished work, instead of the original design, with all the parts commensurable, we have, as it were, a new design in which the parts are only apparently commensurable.

The Measurements of the Masses of the Greek Porticos.—We need not trust to the correct interpretation of these passages either in Plato or Vitruvius, for if such "additions and diminutions" were really made upon the original designs by the Athenian architects of the age of Pericles when designing their works of architecture, we must expect, upon a careful examination of such large works as the Parthenon, the Propylæa, the Erechtheium, the Theseium,—in fact, of all architectural works of magnitude executed, either in Greece or in Asia Minor, during the best period of Greek art,—to be able to discover by measurement the actual amount of the variations that were made in the heights of the several members of each design when they were subjected to those corrections which were essential to produce an apparent harmony between all the parts of the finished executed design; and this is really the case; for in each example, when we compare the executed heights with the heights given in the canon of proportion, the additions and diminutions that were originally made by the Greek architects at once appear. There is no difficulty when the given quantities, on which the calculations are founded, are correctly assumed, in arriving at the same results by calculation that we obtain by measurement, and this we shall now proceed to explain, commencing with the position of the points of sight.

The Position of the Points of Sight.—If the points of sight were not given in position, the calculations and corrections could not be made; and in the case of the Athenian Acropolis, these several points of sight are practically indicated by the relative positions of the Propylæa, the roads of approach, the levels, the arrangement of the sculpture, and the position of the Parthenon and the Erechtheium.

With regard to the Parthenon, there is sufficient space left to allow of a north-west angular view to be seen from the road close to the statue of the Minerva Promachus, and also for a south-east angular view to be seen from a point near to the south fortification-wall; in these examples there is sufficient space allowed for the eye to embrace the diagonal line of the Temple (which is the line of greatest extent) within a given horizontal visual angle of 45 degrees, which has, therefore, been assumed in every example as a given quantity, and the calculations, agreeing with the measurements, must prove, not only in the case of the Parthenon, but also of the Erechtheium and of the Propylæa, and of other Greek designs, that this horizontal

* Plato, translated by G. Burgess, M.A., vol. iii. Bohn, London.

angle of 45 degrees has been correctly assumed. The Greek idea of having a fixed point of sight, and of making the visual angles of the perspective design commensurable with each other, may appear to some minds as a waste of time and of calculation, but the painter, the sculptor, and the architect all considered their designs to suit some favourable points of view; and although the calculations in the case of the Parthenon were made to suit one point of sight, which is essential, yet the spectator moving either to the right or to the left of the calculated point of sight, within the possible limits of a Greek design, scarcely alters the result of the calculations. The spectator was by no means confined to one exact point of view, although it is requisite that a fixed point of view should be determined upon to suit which the calculations were made.

The Calculations of the Apparent Magnitudes.—In book i., chap. i., Vitruvius states that "arithmetic, assisted by the laws of geometry, determines those abstruse questions wherein the different proportions of some parts to others are involved," and he appears to refer also to the descriptive geometry of three dimensions, for the tracing of the plan and elevation of the design, and also to the perspective view of the same, accurately drawn; and in book vi., chap. 2, he refers to the special calculations required for determining the apparent magnitudes and the additions and diminutions that have to be made, as he says, "in such a manner that the deviation from the general laws of proportion will not be perceptible."

The Given Quantities.—Before these calculations can be made, certain quantities must be given, or, as Vitruvius says,—"It becomes necessary in the first place to institute laws of proportion upon which all our calculations must be founded."

Firstly. This was done for the Greek porticos when the first given heights, widths, and projections are all laid down according to a fixed canon of proportion.

Secondly. "The plan exhibiting the length and breadth of the whole work, and the several parts of it, must be formed," and the position of the point of sight must also be given upon this plan, "so as to comprise the whole extent of that scale which the eye is able to embrace at one view"; (see Aristotle) in the case of the Parthenon, this will be the diagonal line of the Temple.

Thirdly. The position of each design upon its artificial platform with regard to the point of sight, and the height of the upper step, either above or below the horizontal plane, must be also given.

The Temple is now supposed to be fixed in position with regard to the point of sight,—the given dimensions are all commensurable, and if there were no corrections to be made we might at once proceed with the designing of the columns and the entablatures, and this is actually the case in some small designs in Athens, and in the Roman porticos; but not in the Greek works of magnitude, like the Parthenon and the Propylæa. In these cases certain corrections have to be made by calculation, so that the perspective design may appear to the spectator to be perfect in apparent proportion, and the slight irregularities were thrown into the executed work, where they escaped detection. The horizontal straight lines have also to be converted into convex lines.

The Calculations of the Apparent Magnitudes of the Parthenon.—Mr. Pennethorne gave a detailed explanation of the calculations for determining the apparent magnitudes of the Parthenon, but this would not be fully understood without his illustrations.*

Health Lectures.—The National Health Society have arranged the following course of drawing-room lectures, to be delivered at 23, Hertford-street, Mayfair (by kind permission of Mr. C. Matthews):—

Thursday, Feb. 27th.—Mr. T. P. Teale, of Leeds, "Below the Floors and Behind the Walls in Modern Houses—Invisible Dangers."

March 6th.—Professor W. H. Corfield, "Put your House in Order," illustrated by specimens and models from the Parkes Museum of Hygiene.

March 13th.—Mr. Ernest Hart, "Milk and Water."

March 20th.—Dr. Arthur Edis, "Counter-seats for Shopwomen; or, the Evils of Incessant Standing."

March 27th.—Mr. Horatio Donkin (Physician to the East London Hospital for Children), "The Dangers of Childhood."

April 3rd.—Mr. Ernest Turner, architect, "The Ideal Dwelling-house."

April 10th.—Mr. George Romanes.

* To be continued.

LIVERPOOL REFORM CLUB.

The Liverpool Reform Club has been formally opened. It is situated on the north side of Dale-street, nearly opposite North John-street, and occupies the site of the old George Hotel. The building has been arranged for the purposes of a first-class club, and its capabilities extend to the accommodation of about 1,200 members. Granite, about 6 ft. high, forms the base of the building, above which rises the main walling of Ruabon bricks, relieved here and there by Woolton red stone in the dressings. The principal entrance is in Dale-street, in the centre of the building, the portico being balanced by granite columns from Shap, in Westmoreland. From the entrance-hall, the first or principal floor is approached by the grand staircase. On the right, there is the reading-room, about 40 ft. long and 27 ft. wide. The aspect is pleasant, and the windows look on to Dale-street. The remaining portion of this floor is principally occupied by the large dining or coffee room, about 87 ft. long and 27 ft. wide. It runs the whole depth of the building from the Dale-street front. Continuing up the staircase, the smaller dining-rooms, smoking-room, and billiard-room are reached, all on the second floor. Dressing-rooms and bedrooms for the convenience of local and country members form a portion of the scheme. Separated from the club-rooms proper, but within easy communication, are placed the offices for carrying on the work of the club. The kitchen has lifts, dust-shoots, &c., *en suite*, connecting the different floors of the building with this department, the whole of which is on Dennett's fireproof arching. The service of bells is arranged on the pneumatic system all over the establishment.

The general contractors were Messrs. Jones & Sons, Liverpool. Messrs. Gillow & Co., Liverpool, supplied the furniture, &c.; Messrs. Jeakes & Co., London, the kitchen ranges; Messrs. Hardman & Co., Birmingham, the gasfittings and ornamental ironwork; Mr. Jennings, London, the lavatory fittings; Messrs. Bunnett & Co., London, the lifts; and Messrs. Homfray the pneumatic bells and speaking tubes; Mr. Thos. Dove being the clerk of works.

The building has been erected and the furniture supplied under the superintendence of the architect, Mr. Edmund Kirby, Liverpool.

WESTERN TOWERS, BAMBURG CATHEDRAL.

It is the practice of some German critics and writers upon architecture to claim for their country the introduction of Gothic architecture and the earliest developments of the Pointed style; in fact, so convinced are the Germans that this beautiful architecture was their own invention, that they absolutely call it the "Old German style," and they are quite indignant if one suggests that other countries can lay a better claim to its paternity. At the risk, however, of offending some of the archæologists of the "Fatherland," we must again point out the fact to which we have more than once alluded in this journal, that there are no buildings in Germany of an earlier date than the year 1200 which are constructed in the "Pointed style"; nor, as far as we have been as yet able to discover, are there any buildings previously to this date which show the Gothic arch used to any extent even in combination with earlier forms; whereas both France and England possess numerous buildings of a thoroughly-developed Gothic style dating back twenty and even thirty years before the close of the twelfth century. The cathedral of Laon, 1173; the cathedral of Notre Dame, Paris, consecrated in 1172; the cathedral of Soissons, 1175; the choir of Canterbury, commenced 1174, are examples of this; whereas the western portion of the cathedral of Bamburg, which bears the most remarkable resemblance to the cathedral of Laon, was not commenced until 1274, that is to say, 100 years later than its great French prototype. The similarity between the towers of Laon and the Western Towers of Bamburg is so remarkable that it is impossible to avoid the conclusion that the Germans deliberately copied, in fact almost reproduced, the designs of their French neighbours; nor does this reproduction by the Germans, of French designs, seem to have been confined to architecture alone, for Mr. J. N. Westlake, who, we need scarcely say, is an excellent authority on the subject, has pointed out that the early examples of German stained glass are positive reproductions of French works, of an earlier date; in fact, that gentleman is of opinion that even during the eleventh and twelfth centuries, the Germans borrowed all their decorative art from the French. We are hardly prepared to go so far as this, and believe that at least one school of art which existed in Germany, that of Hildesheim, traces its traditions directly from ancient classical models, and was in advance of any French school of so early a period: be this as it may, we are thoroughly at one with Mr. Westlake in believing that the Germans can lay no claim to the invention of painted glass, or to those beautiful forms of scroll-work and foliage, which developed themselves towards the end of the twelfth century.

Upon looking at the dates of the earliest Gothic churches erected in Germany, we shall see at once that the towers of Bamburg are quite as advanced in style as other works erected in that country during the thirteenth century; for example, the Cathedral of Limburg-on-the-Lahn, which is quite Transitional in character, was commenced in the year 1235; the western porch of St. Paul's at Worms, also Transitional, 1261. The church of St. Martin at Worms, which is rather more advanced in character, was commenced in 1265. Now when we consider that the nave of Amiens was erected between the years 1230 and 1240 (that is to say, was commenced five years before Limburg, and thirty-five before St. Martin's at Worms, and has perfectly-developed bar-tracery and moulded cuspings to its windows), we think it impossible that the Germans can lay claim either to have originated Gothic architecture, or in any way to have furthered its early development. Who, on looking at the illustration of Bamburg Cathedral, with the round arch intermixed with the pointed, with the plate tracery rose-window in the transept, with a thorough Romanesque-looking eaves-cornice, could for a moment suppose that they date nearly fifty years later than the choir of the Cathedral of Beauvais? Yet such is the fact.

The cathedral of Bamburg is an exceedingly interesting building, consisting of a nave and aisles and two apsidal choirs, one at the east end and one at the west end, short transepts at the junction of the west choir with the nave, and four remarkably fine towers, two flanking the eastern choir and two the western. There are crypts below each choir, and a large chapel, composed of three naves of equal height and length, opens out of the south transept. The eastern portion of the cathedral is very rich Romanesque work, and the western Early Pointed. The spires crowning the four towers are modern, and when they were erected, at the close of the eighteenth century, the gables of the western towers were tampered with, and made of lower pitch; formerly they must have resembled those of the western towers at Limburg-on-the-Lahn, and they are so represented in the interesting view of the town given in the "Nüremberg Chronicle."

The cathedral is exceedingly rich in ancient monuments, but we reserve a description of these for a future occasion.

The ancient building in the foreground of our view is the former archbishop's palace; it is a good example of "post and pan" work of the latter part of the fifteenth century.

The Institution of Civil Engineers.—We are asked to state that supplemental meetings, for the reading and discussion of papers by students of this Institution have been appointed for the following Friday evenings, at seven o'clock:—

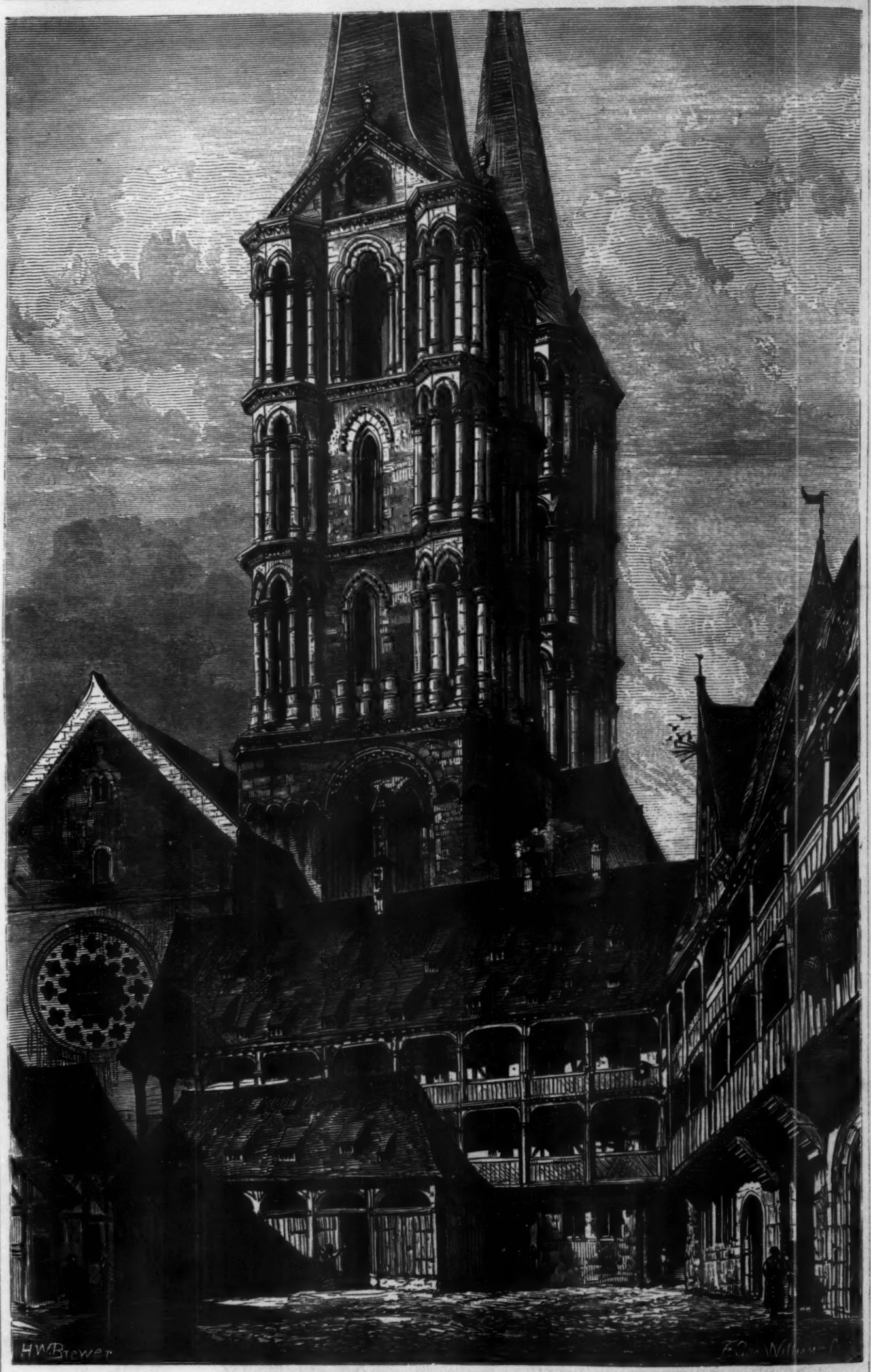
Feb. 14th.—"The Excavating of a Tunnel in Rock by Hand Labour and by Machinery." By John C. Mackay, Stud. Inst. C.E. Mr. Hayter, member of Council, will preside.

Feb. 21st.—"On the Design and Construction of Wrought-Iron Tied Arches." By Percy W. Britton, Stud. Inst. C.E. Mr. Barlow, vice-president, will preside.

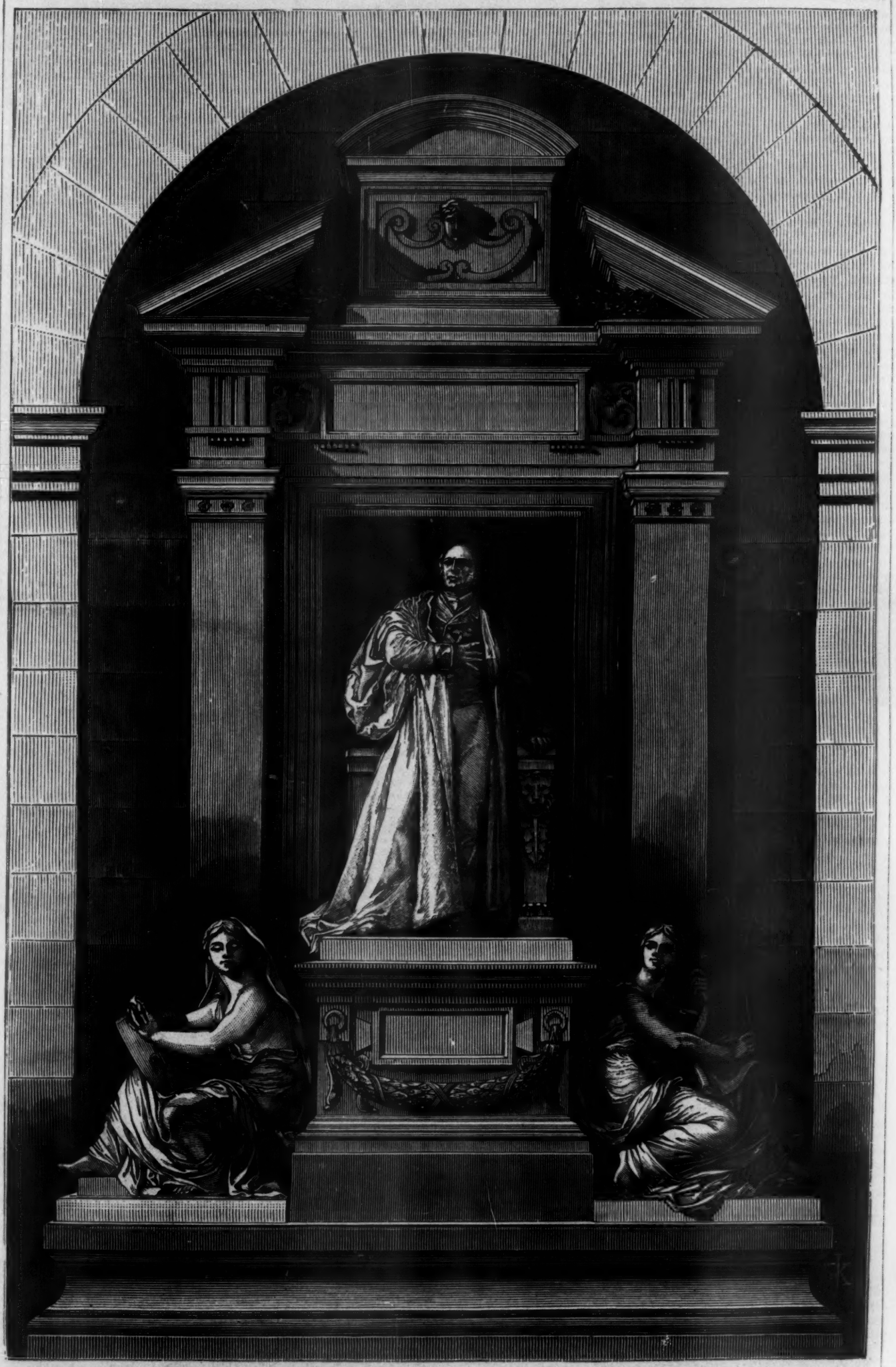
Feb. 28th.—"On the Cost and Construction of a Cheap Light Railway." By Alfred W. Sslumper, Stud. Inst. C.E. Mr. Bruce, member of Council, will preside.

March 7th.—"The Interlocking of Points and Signals, and the Electric Block System." By George D. Marston, Stud. Inst. C.E. Mr. Woods, member of Council, will preside.

The students have been urged to prepare themselves for the discussions, by consulting the papers, which are now open for inspection at the Institution, and they have been informed the meetings will be continued, provided other original papers of adequate merit are received. It has also been stated that a Miller Scholarship, not exceeding 40*l.* in value, and tenable for three years, will be awarded for the best paper of the session, if of sufficient importance, and that original communications by students, which may be deemed worthy of record, will be printed in the "Minutes of Proceedings" of the Institution.



WESTERN TOWERS, BAMBURG CATHEDRAL, GERMANY.



MONUMENT ERECTED TO M. BERRYER, IN THE "SALLE DES PAS PERDUS" AT THE PALACE OF JUSTICE, PARIS.——M. HENRI CHAPU, SCULPTOR; MM. DUC AND DAUMET, ARCHITECTS.

M. BERRYER'S MONUMENT.

PERFORMING his task with a steady consciousness, and remarkable integrity of purpose, no one ever sought to serve his country in troublous times with purer disinterestedness, or with a keener sense of justice, than did Pierre Antoine Berryer.

Born in Paris, 1790, he commenced studying under the Oratorians of Juilly with the intention of taking holy orders, but at his father's request he left that body to apply himself to the law, and first appeared at the bar at the age of twenty-one. He enlisted in the Royal Volunteers, and when Napoleon again appeared upon the scene, after his escape from Elba, Berryer followed Louis XVIII. to Ghent. When, however, the Bourbons returned to power, he, with a strict sense of justice, volunteered his services for the defence of the generals who were brought to trial for their conduct during the fatal "hundred days." He assisted his father and the elder Dupin in pleading the cause of Marshal Ney, and himself defended Generals Cambronne and Debelle. The following year found him pleading for Generals Canuel and Donnadieu, accused of conspiring against the life of the king. One of the greatest champions of the liberty of the press, his opinions kept him from preferment. His defence of the *Journal des Débats*, the *Drapeau Blanc*, and the *Quotidienne*, the trials of the bankers Seguin and Ouvrard, that of Lamennais in 1826, and others, firmly established his reputation. Returned as member for Puy in 1830, he took an active part in the revision of the charter, agitated trial by jury for press delinquencies, reduction of the stamp duties on newspapers, the nomination of "maires" by the electors, the right of public meeting, &c.; he voted against the motion for the banishment of the Bourbons, supported the Bill entitling the priests to marry, and also that for the re-establishment of divorce; he was, further, a strenuous opponent of the slave trade. In the session of 1833 he appeared at the tribune to demand the release of the Duchess of Berry, whom he had endeavoured to dissuade from her rash projects some months previously, and for which he was brought to trial, but acquitted. Shortly afterwards, all France rang with the news of his eloquent and vehement defence of Chateaubriand. In 1840 he was made Prince Louis Napoleon's counsel in the trial for the Boulogne escapade. A visit to Charles X. at Goritz in 1837 had already given offence to the July Government, when, in 1843, he went, with other Legitimist notabilities, to London to present his homage to the Comte de Chambord, and hail him King of France.

After the fall of Louis Philippe, Berryer was returned as member for the Bouches-du-Rhone to the Constituent Assembly of 1848, and the Legislative Assembly of 1849, speaking principally upon questions of finance and administration.

At the *coup d'état* of 1851, he was one of the number who met at the "Mairie" of the tenth arrondissement, and proclaimed, but in vain, the termination of the Government of Louis Napoleon. He afterwards retired from public life, but was again returned to the "Corps Législatif" in 1863. He died five years afterwards, sincerely mourned by all France.

The monument erected to his memory in the "Salle des Pas perdus" of the Palace of Justice was shown at the International Exhibition last year in the building of the Ville de Paris, and the principal figure, in white marble, of Berryer was exhibited by the sculptor, M. Chapu, in the "Salon" of 1877; the two figures (also in marble) of "Eloquence" and "Fidelity," sitting on the right and left of Berryer, are by the same sculptor.

The architectural portion of the monument is due to the late M. Duc and M. Daumet.

Rural Sanitation.—According to the local *Courant*, the Hexham Union Rural Sanitary Authority seems to be actively bestirring itself to provide sewerage works for the various villages of the district. A contract has been let for the works at Prudhoe, according to a comprehensive scheme prepared by Mr. John S. Hodgson, C.E., Hexham, and the Parochial Committees of two other townships have been instructed to consult the same engineer with reference to the sewerage of their villages. Works of water-supply are also in contemplation for various localities within the Authority's area.

GREAT WORKS OF GREEK ART.

MR. C. T. NEWTON, C.B., of the British Museum, lectured on Saturday evening last, at the College of Men and Women, Queen-square, Bloomsbury, on "The Chryselephantine Statues of Athene in the Parthenon, and of Zeus at Olympia, by Phidias." The lecture was in continuation of the preceding lectures, which have been reported in the *Builder*.

In the second century before the Christian era, or, to give a little more precise date, about the year 167 B.C. (said Mr. Newton), a great Roman general, fresh from the conquests of Macedonia, marched down to Greece. He visited Olympia, and there beheld for the first time the august form of the Jupiter of Phidias, or, to give his Greek name, the Olympian Zeus. That great general, whose name would be familiar to the students of Roman history, was Paulus Æmilius, and it was recorded by more than one ancient author that when he beheld this great image of the god he acknowledged the presence of the deity, and he at once offered a sacrifice such as he would have offered as a triumphant general at the Capitol. He (the lecturer) introduced his subject with this anecdote to show that this Olympian Zeus of Phidias was not merely one of the wonders of the world, marvellous from the excellence of its material, marvellous from the beauty of its workmanship, but it had an effect upon men's minds, an effect in the way the artist intended, so as to produce a profound religious emotion. This testimony with regard to Paulus Æmilius did not stand alone. It happened that from a number of writers they had concurrent testimony as to the greatness of the impression this work produced on the spectator. These writers had capacity for judgment, and perhaps one of the most striking passages was by Dion Chrysostom, who had written a most interesting account about the Olympian Zeus. This passage was of peculiar interest as showing how a philosopher and a highly educated ancient writer interpreted the motive of this statue. He described this creation of Phidias as the image of the supreme ruler of the universe, the dispenser of peace, the god who, sitting on his throne, saw at intervals the Greek world of peace, the hostile races meeting together to celebrate one common festival; and then he dwelt especially on that mingled aspect of majesty and of benevolence towards man which was apparent in the expression of the god. "If there is any one utterly weary in his soul [he says], who has borne many misfortunes and sorrows in his life, who has lost the enjoyment of sweet sleep, such a one I can imagine standing before the Zeus of Phidias and forgetting, as he gazed on it, all the sufferings to which human life is heir, such a brightness and charm is there in this work."

This was very high testimony, continued Mr. Newton, of a mind not given to exaggeration. There were two more testimonies equally interesting. Cicero, who, besides being one of the greatest of ancient orators, was one of the greatest of ancient critics, said that Phidias had an ideal in his mind which he did not derive from any one particular man, from any one specimen of humanity, but from the conception of ideal beauty, drawn from the whole type of man, and embodied in the human form, and he supposed that the sculptor of the Olympian Zeus contemplated, as it were in his mind's eye, this image of ideal beauty, and then embodied it in his work. The third notice of the Olympian Zeus he would mention was the testimony of Quintilian, who said that Phidias produced so great an ideal work that he added something to the received religious feeling of his time. These were the testimonies of highly intellectual writers as to the effect which the art of Phidias produced upon men, not of one generation only, but of successive generations, extending from the date of Phidias down to the time of Quintilian, the second century of the Christian era. There were, besides, a number of witnesses as to the majesty of the great work of Phidias, which he need not then trouble them with. The first fact they might mention was, that it was one of the seven wonders of the Roman world. It was supposed to comprise everything for marvellous structure or for beauty, as the Temple of Diana at Ephesus, the mausoleum or tomb built for Mausolus, king of Caria, the vast brazen image of the sun at Rhodes, called the Colossus, the greatest being the Olympian Zeus.

In regard to this statue, which was so celebrated, not only for its exceeding beauty, but for the richness of the material, it was made of gold and ivory, and therefore called, in the language of the ancients, the "chryselephantine statue." He would endeavour to explain how a colossal statue such as this could be made of gold and ivory. Their notion of an ivory statue was to carve a figure out of a piece of ivory in the solid, but this was not the way the ancients followed. They built up a colossal statue in a very curious way. The temple in which the Zeus stood at Olympia, as they were no doubt aware, had been recently disinterred and measured, and was in a fair way of being restored, its height being about 60 ft., and it had been calculated that the height of this colossal figure, including the lofty throne, was about 42 ft. In order to build up the statue, the method adopted was this: first, the skeleton of the figure was made, probably of Cyprus wood, and upon that the "flesh" was laid on in clay, or some kind of plaster. The exact cast was taken from the model, and the external surface of the clay and the mould that was taken was cut into pieces, and portions of ivory, corresponding exactly in size with these segments of mould, were worked so as to fit into it, so that ultimately the ivory became, as it were, the external skin of the statue which had been moulded from within. It would be asked how they got ivory to lend itself to this means? It was done in this way: the elephant's tusk was sawn into exceedingly thin slices, and then, as they were told, some ingenious persons invented a mode of softening it so as to bend it in the form the artist required, and then, having been bent to the curve necessary, it was fastened by some elaborated systems of joining to the clay and the woodwork below. Of course, a certain amount of this explanation was guess-work, but the main fact remained that the inside of the statue was wood, next to that was clay, and upon that was ivory. Any person who wished to trace this out could turn to an excellent work published in 1815, in which diagrams of statues were given which had been divided in that way. The late Duc de Luynes, the eminent archæologist, actually had a statue made upon these principles. It was a small work made to represent the Athene in the Parthenon, but he (Mr. Newton) never saw it. The objection to this method was the liability of ivory to give way through inward expansion, and it appeared that there was a particular sort of people at Olympia who were appointed to watch these two statues, and to take care that they did not suffer any kind of injury, or from decay. Further, they were told that the climate of Olympia being wet, in front of the statue at the base was placed a sort of tank of oil, and that the climate where the Athene in the Parthenon at Athens was situated being excessively dry, there was a bath of water instead of oil. This had puzzled a great many people. It had been suggested that the true meaning of this was that the inner core of the wood would be liable to swell in a damp climate, and to shrink in a dry climate, and that the shrinkage or expansion would affect the joints of the ivory, as in the case of the Olympian Zeus they were affected, and that the object of the oil and the water was to afford these when either was wanted, that in the one case by certain fine tubes penetrating in the core of the statue when the moisture would be absorbed.

In regard to the chryselephantine statue, the "flesh" was made of ivory, the robes of gold, and the eyes of precious stones. Pausanias told them that this statue of Zeus was represented seated on a magnificent throne, and that it was 42 ft. high, inclusive of throne. On his head was a crown of olive-leaves. In his right hand was a Victory of gold and ivory, holding a sash, and having on her head a wreath. In his left hand was a sceptre, inlaid with all manner of metals, on the head of which was perched an eagle. The mantle of the god was of gold, enamelled with animals and lilies. His sandals also were of gold. His throne was adorned with gold and precious stones, and varied with ebony and ivory. At each foot of the throne were four Victorys dancing. On each of the front feet were Theban children carried off by Sphinxes; and under the Sphinxes were Apollo and Artemis shooting the Nisbids. Between each pair of feet were four rails. On these rails were the band who fought with Heracles against the Amazons (twenty-nine figures), among which was Theseus. Barriers all round fenced off the throne, on which were paintings by Panainos. Atlas holding up the Heaven, and Heracles about to receive the load.

Theseus and Peirithous, Hellas and Salamis holding the Akrostolion. Heracles and Nemean lion. Ajax ravishing Cassandra. Hippodamia with her mother. Prometheus in the bonds, and Heracles looking at him. Achilles holding up the dying Penthesilea. Two Hesperides bringing the apples. On the upper part of the throne Phidias has placed on one side the Graces, on the other the Horæ, daughters of Zeus. On the footstool were golden lions, and the battle of Theseus against the Amazons.

It might be said that this was a very good description of the statue, but it gave them no idea of the original. He (Mr. Newton) was afraid he must answer by saying that it was the only means they had of forming an idea of the original, and they must trust to their imaginations. It was quite true that they would find on a great many Greek and Roman coins the figure of Zeus. It was quite certain that the upper part of the body was naked, and would no doubt be entirely made of ivory, and that the lower half of the body would be covered with a rich mantle, the effect of which they would imagine in gold. As to the sum that it cost it was not known, but the sum that was invested in gold was. The Zeus of Olympia, he believed, remained intact and without injury all through the Roman Empire, till about the year 400, and it appeared that the temple of Zeus was burnt about the year 408, when the statue was probably destroyed. A curious question was, whether it was at all affected by earthquakes, which certainly visited Olympia from time to time; but of that they had no evidence. It had been said that Phidias, after he had made it, asked for a sign from Heaven, and that Zeus replied by a thunderbolt, which split the pavement of the Temple immediately in front, and that the place was marked for all future time by a bronze vase, which Pausanias actually saw there. What the origin of the story was they could not say; but when the Germans examined the lower pavement of this temple in the course of last year they did find a rent running through it, and they thought it possible that this natural cleft in the lower pavement was the foundation of this legend of Zeus replying by the thunderbolt. There was another point which must be referred to, viz., that one of the buildings which Pausanias mentioned was the workshop of Phidias, where he made his statue, which must have been a long and difficult work to execute. The Germans had found a building upon which a Byzantine church was afterwards built, and which unquestionably had Greek foundations of the early kind, and upon measuring this original Greek building, and comparing the measurement with the temple of Zeus, they found a correspondence so remarkable that a German architect thought that they had found the workshop of Phidias. If this was so, no doubt in this studio he received spectators when his work was on view. They were told that when his work was far advanced he threw open his door, and used to hide and listen to the criticisms that were passed upon the work, and that he took the opinion of the majority of his critics, and altered the work accordingly; on the other hand, it had been said that Phidias was so great a genius that he would not adopt this course.

He (the lecturer) had taken the Zeus of Phidias first, because the ancients considered it the greatest work of this chryselephantine art that existed in the ancient world, and therefore they must consider the statue of Athene in the Parthenon as being of the second rank. The statue was made of gold and ivory, and in regard to the gold they knew what quantity was used. According to the highest calculations of the ancients, there were forty-four talents of pure gold invested in this figure; but Thucydides calculated that there were only forty talents, which represented something more than 140,000*l*. Now, in these utilitarian days, that seemed a large sum to invest in the garments of a goddess, but they must remember that the ancients in the first place had a very different idea about the treasury. They considered that the gods and goddesses were the proper custodians of the public wealth, and thought that it would do them honour to dedicate a large proportion of the spoils of war to them, besides which votive offerings of great value were given to the deities, both public and private. They also allowed private individuals to make deposits. At the beginning of the Peloponnesian war, this 140,000*l*. worth of gold was actually worn by the goddess Athene, as was referred to by Thucydides. Before the war commenced, Pericles made a sort of speech the same as the Chancellor of the Exchequer made in regard to the ways and means of carrying on a war, and explained what the amount of the treasure was in the Acropolis. Besides this, there were the golden ornaments of the goddess herself, which, in times of extreme emergency, must always be removed and used for the purpose of carrying on a war. When the golden garments were borrowed, a sort of promissory note was given to repay the money. This kind of thing did not shake their religious prejudices, and no doubt the priests made it pleasant all round.

In conclusion, Mr. Newton said that this was all he could tell them about the two works of a most celebrated sculptor. He hoped he had made it clear to them that the ancients did not estimate the statues for their excessive cost, but for mere refinement and subtlety of the art they attached their value. They thought that these two statues were the highest embodiment of divinity which the human imagination could conceive, and therefore it was that they were valued, not merely to be dedicated by the people then existing, but by successive generations,—the people who came to see these famous shrines. The meaning of the real aim and purpose of the highest art among the Greeks was not to please man, not to obtain the panegyrics of mortal critics, but to please the gods and to elevate and instruct mankind, by bringing down to them the present deity which they could worship. He hoped on a future occasion to treat of the other branches of Athenian art, which dealt rather with the heroic than with the sublime.

NOTES ON ST. PAUL'S CATHEDRAL.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

At the sixth ordinary meeting of the Institute for session 1878-79, held on Monday evening last, the President, Mr. Charles Barry, in the chair, the following gentlemen were balloted for and declared to be duly elected, viz.:—*As Fellows:* Mr. Alexander Peebles (Associate); Mr. Henry Dent Lomas, of Sheffield; Mr. Thomas Archer; Mr. Arthur Green; Mr. Samuel Knight (Associate); and Mr. William George Coldwell (Associate). *As Associates:* Mr. George William Webb, of Reading; Mr. Wallace Gill, of Bath; Mr. Henry Blackwell; and Mr. Leonard Brisbane Broun.

A letter was read from the Marquis of Salisbury inclosing particulars forwarded by her Majesty's *chargé d'affaires* at Munich of a quadrennial exhibition of works of art to be held in that city in July next. Programmes of the exhibition, and forms of application for space, may be obtained of the secretary of the Institute. All works offered for exhibition must be delivered at the Crystal Palace, Munich, before the 31st of May.

The meeting next proceeded to discuss Mr. Penrose's "Notes on St. Paul's Cathedral," read at the previous meeting.*

The President remarked, with respect to the mosaic marble pavement which the author had stated was already partially laid down, that the design was admirable, and he hoped that the whole of the pavement would be carried out in the same way, replacing the black and white marble floor at present existing. With respect to the decorations above the pavement, Mr. Penrose had only referred to those of the dome,—only a small part of the subject, although, at the same time, a great part in itself. It was a happy augury for the success of the decoration scheme that two such masters of their art as the President of the Royal Academy and Mr. Edward Poynter had agreed to work together so as to make the decoration of the dome a success. Both those artists were, he understood, now engaged upon their studies, and their cartoons would be exhibited *in situ*, so as to enable a satisfactory judgment to be formed of the effect of the completed work, and he ventured to think that in that way all the doubts which had perturbed the committee and the art-loving public would be practically resolved. When the decoration of the dome was completed, however, a very large field for decoration would remain, and it was to be hoped that the remainder of the work would be placed in equally able hands.

Mr. Watkiss Lloyd expressed his approval of the proposal to first of all decorate the dome and its supports, and then to decorate the remainder of the building, as being likely to result in a harmonious and satisfactory whole.

Mr. Whichcord said that as to the hanging of the bells, he understood Mr. Penrose to say that the vibration of the tower during the ringing of the bells was almost *nil*. He believed that the English method of pealing bells, whereby they were made to turn completely over on their bearings, was peculiar to this country. Obviously the vibration resulting from such a mode of ringing was very much greater than when the bells were merely struck by a hammer.

Mr. Statham said the bells were not swung round *over* their centres in ringing. They were first "set," *i.e.*, swung backwards and forwards with increasing oscillation till they reached an inverted position and were stopped by a catch from going further: then the pull of the ringer at the proper moment brought the bell down and right round, till it again reached the inverted position and was again stopped by a catch till the next pull. With regard to the decoration of the dome of St. Paul's, he should like to ask whether it had been at all considered by those engaged in the work what effect the mosaic decorations would have upon the aërial perspective of the building. The question was especially interesting to the Institute, inasmuch as it was one of the very last things in which the late hon. secretary, Mr. Cockerell, interested himself, writing a very sensible letter on the subject to the *Times*.* However fine the mosaics might be as pictures, they might have the undesirable effect of "bringing-down" or decreasing the apparent height of the dome. No doubt if coloured marble or mosaic were used for the floor of the cathedral,—as he understood would be the case,—the "bringing-down" effect of the mosaics in the dome would be materially neutralised.

Mr. E. B. Ferrey said that there were a great many different opinions as to what the real length of Old St. Paul's was. His own impression was that Hollar's plan was perfectly accurate. The late Mr. Ashpitel believed that 690 ft. was the length of the churchyard, but in a work called "London Plates," in the Library of the Society of Antiquaries, the cathedral was described in the margin as 720 ft. long. Hollar showed a wide bay a short distance east of the crossing, where there was a difference of date. The choir itself was completed in 1240, and the eight bays beyond in 1255, and the wide bay evidently formed the division between the two periods. Little was to be gleaned from comparisons of older views of Old St. Paul's, for they showed most extraordinary variations. For instance, in Mr. Crace's interesting collection of views of old London, now on exhibition at South Kensington, there was one very early view of the cathedral, dating from the time of Edward VI., which showed a building, judging by the number of bays, very much smaller than that represented by Hollar's view. Of the two representations, there could not be the slightest doubt that Hollar's was the correct one, showing, as it did, twelve bays to the nave and eight to the choir,—the earlier view showing only six bays to the nave, and being obviously a very rough and inaccurate representation.

Mr. Dawson having made a few remarks with reference to the plan of the chapter-house and the deviation of the axis of the cathedral,

Mr. E. C. Robins, with reference to the suggested effect of coloured decorations in the dome upon the apparent size and height of that feature, said the question occurred to him whether it would or would not be detrimental to the building if the dome were to appear to be a little lower than it appeared to be at present? He thought that Stevens had hit upon the right idea of treating the decorations of the dome, and he thought that in the hands of Sir Frederick Leighton and Mr. Poynter the idea would have full justice done to it.

The President, in closing the discussion, said that as to the interesting question raised by their lamented honorary secretary (Mr. Cockerell), and referred to by Mr. Statham, as to the effect of the coloured mosaic decorations upon the appearance of the dome, he thought that they might with profit remember that Wren, in designing the cathedral, contemplated the use of colour, and it was but reasonable to conclude that he had made adequate allowance for its effect upon the fabric. He thought Mr. Penrose had clearly established the deflection of the axis of the old building, and it was remarkable that in that building, as well as in the others cited, the deflection of the choir was almost invariably towards the north. Remembering the deep religious feelings with which the Mediæval architects designed their buildings, those co-

* See p. 118, *ante*.

* Quoted and commented upon in last year's volume of the *Builder*, p. 774.

incidences would seem to show very distinctly that there must have been some well-understood and generally-accepted reason for it. If he might remind them of a suggestion, the reason for the deflection was a symbolical one, the deflection towards the north symbolising the declination of our Lord's head over the right shoulder, as it was almost invariably depicted in all old representations of the Crucifixion.

The Rev. Mr. Webb wished to say a word on this question, although with reference to the suggested decoration scheme, he would say nothing, except, as one of the defeated minority of the committee, to express the hope that the experiment that was going to be tried would be as successful as everybody could wish. With reference to the symbolism of the declination of the longitudinal axis of the building, among the old ritualists,—*i.e.*, those who looked at the question of ritual from a scientific point of view,—it was believed that the declination of the axis towards the north did symbolise the traditional idea that our Saviour's head declined over his right shoulder. Whether it was made a rule of design by Mediæval architects he did not know. He should be inclined to attribute the deviation of axis to inaccurate setting-out of the work rather than to symbolism.

The President asked why, if such declination of the axis were due to accident, it should always be found towards the north?

Mr. Webb said that if that were the fact, then the President had probably suggested the correct explanation.

A vote of thanks having been accorded to Mr. Penrose for his paper, he briefly touched on some of the points raised in the discussion. He said that the vibration caused by the ringing of the bells was practically *nil*, owing to the massiveness of the tower. As to the effect of coloured mosaics upon the aërial perspective, he believed that it would tend to very considerably enlarge the appearance of the dome. Two of the spandrels beneath the dome were already filled with mosaic, and to his eye the contiguous arches, whenever he looked at them, always appeared to be larger than the others. The mosaic in the dome, presenting, as it would, a considerable quantity of gold ground-work and surfaces reflecting the light from side to side, would have the effect of making the dome appear much lighter. He agreed with Mr. Ferrey as to the general correctness of Hollar's plan of the old cathedral; but he had lately had an opportunity of collating some ancient representations of the church, viz., those in the collection by old Samuel Pepys, at Cambridge. These included a drawing showing the buildings between Old Change and the cathedral exactly as they were shown on the Oxford plan No. 1, mentioned in his (Mr. Penrose's) paper. The pavement represented by the drawings exhibited was only the pavement of the crypt. It had been executed by female convicts at Woking, from full-sized cartoons prepared by him. He agreed in thinking that Stevens's scheme for the decoration of the dome was admirable, and when the cartoons were fixed up, he believed it would be seen that the problem had been satisfactorily solved. Besides the pavement in the crypt, it was of course in contemplation to provide a richly-coloured marble floor for the whole area of the cathedral. As to the declination of the axis of the old cathedral, Professor Lewis had kindly furnished him with another instance of deviation, viz., St. Mary's, Guildford, where there was a declination to the north of 3½ deg. It had already occurred to archæologists that the conventional representations of our Lord upon the cross, with His head lying over His right shoulder, had led to the deflection of the axis in the cases noticed, in all of which the deflection was towards the north. He believed, however, that there were instances in which the deflection was towards the south,—one instance, although a slight one, was known to him, viz., Wisbech Church. He thought there was another possible reason for the deflection towards the north, viz., the improvement of the perspective view from the west end, and he thought that view of the case was strikingly confirmed by the instance of Lichfield Cathedral. At any rate, that reason for the deflection might have been coincident with the symbolical idea referred to.

Mr. Arthur Cates then read Mr. Pennethorne's paper on "The Connexion between Ancient Art and Ancient Geometry, as illustrated by the Works of the Age of Pericles." This paper we print on other pages.

ENGINEERING AND ART.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

At a meeting of this Society, held on the 30th ult., the President (Mr. Charles H. Driver, F.R.I.B.A.) read a paper on "Engineering and Art," in the course of which he said:—

"Engineering," as the word is commonly understood, may be considered to be the science of "construction," and an engineer is likewise understood to be one who practically applies the theory and science of construction to the everyday wants and requirements of our lives. "Engineering" is a very comprehensive word, including, rather widely, all matters relating to the formation of roads, bridges, canals, docks, harbours, lighthouses, mines, drainage, waterworks, sewers, fortifications, building, machinery in general, &c. Properly speaking, engineering is divided into two classes, viz., civil and mechanical engineering. In the first are comprised road-making, bridge-building, canals, docks, harbours, waterworks, drainage, mines, &c., and all the other works which may be classed under the head of railway, hydraulic, and mining engineering; whilst the second is principally connected with the manufacture and use of machinery, the working of metals, the construction of railway plant, steamships, guns, armour, plates, &c. In works of the first class the "contractor" plays an important part, as it is he who executes the work from the designs of the engineer, and on his ability and good management the success of many undertakings very materially depends. In the second class, however, the case is somewhat different, as the mechanical engineer is very generally both designer and executant of the work he undertakes. Thus much for the engineering of the present day, which may be said to have taken its stand, as a distinct profession in England, about the middle of the last century, and has since, by its varied achievements, done so much for the world at large,—much for comfort, much for luxury, much for wealth, but little, alas! for "art." All must admire the wondrous powers of such magicians as Watt, Telford, the Stephensons, Brunel, &c., and all will admit that they and their works have wrought an enormous amount of good; yet we must admit that though their works contain a vast amount of the *utile*, they have little of the *dulce* about them. Such, however, was not the case with the engineers of antiquity, who not only constructed works of pure utility, such as the harbours of the Phœnicians and of ancient Greece, the bridges of boats made by Xerxes to transport his army into Europe, the canal across the isthmus of the peninsula of Mount Athos, the aqueducts, roads, and bridges of ancient Rome, but they constructed, or assisted in the construction of works which are now looked upon as the triumphs of art (architecturally), such as the temples and pyramids of ancient Egypt, the palaces of Nineveh, the splendid buildings of Greece and Rome, and in later times the glorious cathedrals of Europe and of our own country.

"Art" is the result of the endeavour of the human mind to achieve the perfection of beauty, whether it be in form, colour, or sound, and, like engineering, it is universal; but, unlike engineering, it is strictly confined to man, and is the result of that power of selection that man, of all animals, alone possesses. Many animals, birds, and insects execute work which rivals and excels the best and most delicate work of man, but which, although artistic in result as to form or colour, is not art in itself, and birds or insects cannot be credited with "*art*," as they only follow a line of action they have no will or power to alter. The word "art," as generally understood, is applied to all such matters as music, painting, sculpture, architecture, medicine, agriculture, &c., and may be divided into two classes,—viz., "fine art" and "useful art." Music, painting, sculpture, architecture, &c., are specifically termed fine art. Medicine, agriculture, &c., belong to useful art. It is difficult, however, to define exactly where "fine art" ends and "useful art" begins, the two being, as they ought to be, so closely united. "Art," in the abstract, may be considered to be that which gives pleasure to the purely mental faculties as opposed to the purely animal passions. In this sense we view and accept the mental pleasures afforded to us by music, painting, sculpture, or literature, in contrast to the bodily pleasure we obtain by warmth or coolness, eating and drinking, rest, &c. Again, the pleasures afforded by art are not confined to individuals or nations, but are universal, whilst those which are corporeal are for the most part personal and selfish. The beauties of nature, such as are seen in fine landscapes, glowing sunsets, the flowers, the songs of birds, &c., yield pleasure to all, and of them there is no monopoly, and therefore they belong, in the truest sense, to art; and it is in this sense, and with this aim, viz., that of giving the greatest amount of pleasure to all, that the painter, the poet, the musician, and the architect should work. The mental pleasures which are embodied in the word "art" reach us chiefly through the eye and ear, the organs of smelling, tasting, and feeling ministering more to our bodily pleasures. Of the two which we may call the artistic senses, viz., seeing and hearing, the one which now concerns us at present is that of "seeing," for it is by means of sight that we learn to appreciate those attributes of "art" that are most nearly connected with works of construction, viz., "sublimity," beauty, grace, harmony, picturesqueness, proportion, order, and fitness; as, for example, the agreeable effect designated by "fitness" is an artistic pleasure which may be called the æsthetic of the useful; as, when a work is not only done effectually, but done with the appearance of ease, or the total absence of restraint, difficulty, and pain, we experience a delight quite different from the mere satisfaction growing out of the end obtained. Much of the pleasure of architectural support is referable to this source. Among the pleasures that are afforded by artistic arrangements may be noticed the sense of "unity in multitude" arising when a great number of things are brought under a comprehensive design, as when a row of pillars is crowned by a pediment. The use of simple figures,—the triangle, circle, square, &c.,—for enclosing and arranging a host of individual parts has a tendency to make an easily apprehended whole out of a numerous host of particulars. In all large works abounding in detail, we crave for some such comprehensive plan whereby we may retain the total while surveying the parts. A building, a poem, a dissertation, or a speech should have a discernible principle of order throughout, the discernment of which gives an artistic pleasure even to works of pure utility.

Let us now proceed to consider my third point, viz., are engineering and art of service to each other, and can they be united? I think, perhaps, it will be as well to sub-divide the question by seeing, firstly, whether engineering and art are of service to each other; and, secondly, can they be united? Let us, then, begin by considering how art is benefited by engineering. Engineering benefits art when engineering is in itself good and right, and when it does not benefit art, it is because it has been wrongfully and improperly applied, and I must ask you to take this remark at what it is worth, for time will not permit me to go fully into the point; but, as an instance of the good that accrues to "art" from engineering, I may refer to printing, and its attendant belongings. How much does art owe to it? Truly, in the days when printing was unknown, there were then, as now, poets and philosophers who expressed their thoughts in poetic language, and chronicled in strong prose the actions of their fellow men. But to how limited a number was the pleasure that their works afforded confined, as compared with the countless thousands who now delight in their genius? Then every copy had to be painfully transcribed, each copy taking months, perhaps, to complete. Now, by the aid of engineering (machinery), hundreds of copies can be supplied daily. Engraving, again, is an art that has greatly benefited by engineering science; for when it was, as it used to be, confined to copper plates, comparatively few copies could be produced. The copies thus produced were necessarily so costly, that only the wealthy could obtain them. Now, by using steel plates and the electrotype process, the copies are so multiplied, and thereby cheapened, that they are within the reach of all. Engineering affords great facilities for reproducing beautiful form and material, as, for instance, in such matters as porcelain and glass ware, iron and bronze work, textile fabrics, &c., thereby affording pleasure to many. But it may be,—as it has been said,—that all this tends to vulgarise art, and that machinery-produced articles, however beautiful, are not artistic, *because* they have been produced by machinery. This argument (I speak with all deference) is, I think, very fallacious. If a vase or a cup is in itself artistic in design, and is good art, so

are equally so the 20,000 copies of it, provided they are exact copies, such as machinery has the power of making.* And, again, a gardener produces from a chance seed, or, by care in cultivation, a flower or plant that has some especial point of beauty, and for which he obtains a very large price. By-and-by, from cuttings or other means of propagation, the plant or flower becomes common, and can be bought for as many pence as it cost pounds before. The plant or flower has not changed, it has just the same beauty as it ever had, but instead of pleasing only a few it pleases many. And it is on the ground that they give mental pleasure to many, that I claim for the multiplied copies of an artistic original the right to be themselves considered artistic. Engineering itself, however, is not artistic, nor does it directly produce art, but it *does* disseminate it, and, therefore, engineers may very fairly be said to benefit art.

But now let us consider how Art reciprocates the benefits she receives from Engineering. In the earlier days of engineering, art certainly was of great service to engineering by teaching those who practised it to clothe their works with beauty; it taught them, when they wanted a vertical support, to give it a tapering form, to give the gentle swell of the entasis to the column, thus satisfying the eye's sense of beauty and grace; to build the temple, the palace, and the cathedral all with proper fitness, and all with beauty. Though Engineering and Art are, and have been, co-existent, Art, is the master, directing and guiding Engineering into the right paths; and while Engineering acknowledges this mastership of Art all is well; but when, as is the case in these modern times, Engineering strives to obtain the mastery, the result is chaos as regards art. Modern engineering no longer pays allegiance to art, and arrogantly considers that it can do quite well without it, and hence it is that we have gone on with an increasing loss of beauty in the works of our modern engineers (this remark, however, applying only to the civil, and not to the mechanical engineer). The modern engineer seems utterly to ignore beauty of form; if he has to use a vertical support, he will probably make it of the same thickness all the way up; if he wants a buttress, he will put a great lump of masonry or brickwork in, without thought as to whether it will look ill or well, but calculated, I grant you, to do to an ounce what it has to do. There is an immense amount of thought in their work, but no mind,—I mean in an artistic sense; and even the thought they give to their work is of a sordid kind; for while they study how to use their material economically, they omit at the same time to study how to make their work pleasing, thus leaving half their work undone. I admit that engineering possesses a strong point of affinity to art in its *truth*, and by this I mean the honest construction employed by engineers in their work, never disguising or hiding it, but letting it be plainly visible to all; and there is a good honest purpose in what they do, and the sentiment of reality and truth, as opposed to fiction and falsehood, appealing as it does to our practical urgencies, disposes us to assign a high value to every work in which truth is strongly aimed at, and to derive an additional satisfaction in work in which fidelity of rendering is induced upon the charms peculiar to art. But while we admit and admire the truth of the engineer's work, and give them their due meed of praise for what they do, we must not forget at the same time to blame them, in that they leave so important a part of their work undone; viz., the making of it artistic. To my mind it is very nearly of equal importance that a building, a bridge, or whatever it may be, should be of good form and pleasing to the eye, as to be strong. There is an impertinence and brutality and want of regard for the feelings of others in many of the erections of late years,—the work of modern engineers. Consider how the Thames at London has been maltreated, and I ask you, as reasonable men, what right have we to inflict on ourselves and future generations such awful examples of the selfish disregard of all that is beautiful as have there been perpetrated? Our forefathers left us, their successors, works of beauty. What shall we leave our successors?

What remedy is there for this? Can Engineering and Art be united, and if so, how? My answer is, yes, and by means of Architecture; for though, as I have said, Architecture is to be considered as the child of Engineering, yet it is through the graces of that child that we must hope to again reconcile and unite Art with engineering. I say "again reconcile," for in old days Art and Engineering were united, and Architecture was their offspring. We moderns have divorced them; let us re-unite them. But how will Architecture unite the two? Engineering is the science of construction. Architecture, the art. Engineer is the hard matter-of-fact, uneducated man of business. Architect is the cultured and polished gentleman. Architecture is educated engineering. A man may be honest, bold, truthful, and business-like, but hard, selfish, and inconsiderate, with no knowledge or care for the beautiful. He is the modern engineer. Another may be honest, but timorous, uncertain, and unbusiness, kindly considerate with respect to the feelings of others, and with a great desire for the beautiful, often failing from lack of power. He is the modern architect.

Perhaps you will think I do not draw a flattering picture of the representatives and practisers of that art by which, as I have already told you, art and engineering can be united. Well, that may be true, but it is only true as regards the modern architect, as my first picture is of the modern engineer. The modern architect is as the times, his own want of pluck, and the modern engineer, have made him; he, if I may say so, has been bounced and bullied out of his proper position by the engineer; and much that of late years has been done by engineers should have been done, and would have been better done, by architects, if they had but retained their proper position by keeping themselves abreast of the times. I have given you a figurative sketch of the modern engineer and the modern architect. I will give you one as to the past. Here we have a man who is honest, bold, and truthful, certain and business-like, with kindly regard for the feelings of others, an intense love and knowledge of the beautiful, with a desire that all should participate in the pleasures it affords, and having the will to do good work, has also the power to execute it; he is the architect and engineer of old, the architect and engineer being one. . . .

The difference in the way an engineer and an architect would set about the same piece of work, if they had it to do, would, I think, be as follows, viz.:—The engineer would begin by studying the purpose of the intended structure, then consider as to the best materials of which to erect it, and calculate to a nicety how little of each material he could use. If he wants a door, he puts in one; if he wants a window, a window is put in; but he never studies or thinks for one moment whether he can, by placing his door or window in some other position, improve the appearance without altering the utility of his work, and the result is, his work is as bald and ugly as possible. He then, perhaps, proceeds to what he calls "ornament" it, by sticking on here and there a moulding, which as likely as not he places upside down, thus destroying the only grace his work possesses, viz., truth; and then says, with satisfaction, "See what we engineers can do: we want no architects with styles and orders to teach us what to do." On the other hand, the architect (I speak of the true architect) would first, like the engineer, consider well the purpose of his intended building, and, like him, consider as to the best material to build with, and how best to use it. He also would place his doors and windows in their most useful positions; but, in addition, he would, from the first commencement of his work, have in mental view before him a certain effect, which he would strive to produce, and thus, while so planning his building as best to suit the requirements of the work, he at the same time makes it pleasing and artistic; and when the work is finished, it needs not the extraneous aid of moulding or applied ornament, for all that is wanted in that way forms part of the structure itself. It is common to find engineers twitting architects with their want of knowledge of scientific construction; but I think I can safely say of architects that they, as a body, have a far greater knowledge of practical engineering than engineers have of architecture,—as their works show,—the architect's failures in "construction" being as nothing to the engineer's failures in "art."

"THE INDUSTRIAL CRISIS."

Sir,—When I forwarded a letter under this heading, for publication in your issue of the 18th ult., I did so with the full knowledge that it would fall after the manner of a small bomb-shell into the camp of a certain clique of your readers. But it was done without any wish to fire viciously into their midst. I shot rather into the air just above them, hopeful that the report would awaken the sleepers, and make those who watched more vigilant than ever. I am glad to find by the correspondence signed "Seagirt Albion" and "Jno. Lewis Jaquet," that these anticipations have been verified.

For a moment, then, let us glance at a curt summary of what has been elicited.

As an illustration in support of the powerful article that appeared in your publication for the preceding week under the above heading, I mentioned, as a passing fact, to be taken for exactly what it might be worth, that upon an English workman leaving my establishment twelve months ago, the vacant place was filled by a Prussian, who engaged himself at half the "screw" of his predecessor, and who had continued ever since to occupy the position with credit to himself. To this, "Seagirt Albion" replied that foreigners "demand more money than they are actually worth in comparison with Englishmen," and that he never knew a foreign workman, "however inferior, willing to receive less than 1s. or 1s. 2d. an hour" as remuneration for his labour. On page 160 Mr. Jaquet,—it is excusable that one with so pronounced a French patronymic should take exception to any good thing being said of a Prussian,—bears similar testimony, and winds up by asserting that I pay foreigners but an "ill compliment in saying they will work for less money than any English mechanic" will do. Thus we see my bare assertion that foreigners work for lower wages than their English brethren meets with an unqualified denial from two several correspondents, to whom, I am sure, we give every credit for singleness of purpose and honesty of intention; but, facts are stubborn things, so it may be just as well to look at a few, and see if they are to be got over or not.

First, however, let me observe that I occupy a wholly disinterested position. I am *quite* an Englishman, and whilst open to give every one his due, am by no means "wrapped up" in foreigners. I know too well what it is to toil, as a journeyman, amongst them in their own lands, and I know that, as a rule, a great deal of prejudice exists,—especially in such countries as Italy and Spain,—against strangers. In the former country I have worked hard enough, goodness knows, for three lira a day (*i.e.*, 300 *centissimi*=2s. 4½d. English money), and then have been told, times enough, by the natives, that I was "taking the bread from their children's mouths," the remark being accompanied by a pantomimic gesture and allusion to the knife.

During the late masons' strike, I urged in these columns that we could not possibly shut our eyes to the capabilities of foreigners, and foretold that the introduction of such men into this country would certainly be fatal to the strike. I also took occasion to remark that I believed many of the laws of the union were altogether as prejudicial to individual success as they were to the nation's welfare, and I queried whether a thorough unionist ever succeeded in making a position for himself in the world. This latter assertion was contradicted by a correspondent under cover of a *nom-de-plume*, and a builder of high standing in Bristol was cited by name as an instance of a union-man making headway. An indignant denial by the gentleman in question, together with the scathing retort that he considered the unions the great curse of the land, followed this, whilst the sequel to the strike itself showed whether my judgment of foreigners' productive power was overdrawn or not. In my own establishment, no man is ever asked whether he is a "society man" or not. I am as profoundly indifferent as to a man's views upon this point as I am as to his religion, and as I pay a somewhat higher rate of wages than does any one else in the city in which I reside—higher, indeed, than that which the local societies deem the standard—I think it will be allowed I am in a position to state facts, without in any way meriting the accusation that I am biased.

For several years we, most of us, have had opportunities for seeing specimens of the beautiful marble mosaic floors that have been laid by

* If it were possible to make ten thousand copies of the "Apollo Belvedere," each so perfect that it could not be distinguished from the original, the original would lose none of its value artistically, it would still be as beautiful as it ever was: it might perhaps be of less money-value; that, however, is a small matter,—"art" has nothing to do with "money."—C. H. D.

Italian workmen in so many parts of our country. At Mr. Waterhouse's noble Town-hall at Manchester, and other places, I have seen these men working away, hours after all Englishmen have knocked off: Saturday and week-days just the same. The result is, that effective marble inlaid floors are laid by the firm who have imported these foreigners at 1*l.* per square yard. This is a price, it is said, we cannot touch; and referring thereto I note that a contemporary recently says:—

"Speaking from experience, we have found the Italian workmen sober and industrious, and an English workman does not possess their patience, delicacy of touch, or artistic feeling, which is necessary, even for fitting together the small pieces of marble for a mosaic of simple design. One of our workmen would altogether mar the effect of a curved line by some inartistic method of placing the blocks."

In regard, again, to *parquet* work, much of it has long been procured from abroad, but the materials have been laid by ourselves. Now, however, Hungarian workmen have been introduced into this country with a result, we are told, disastrous to English workmen, who, as regards price, cannot compete with them.

Mr. Thomas Brassey, in a lecture at Edinburgh a week or two ago, gave interesting statistics as to the relative cost of English and foreign labour. Referring thereto he said that,—

"He found that the cost of brickwork in the construction of sea-locks in 1870, 1871, and 1872, in Holland, was 1*l.* 1s. 2d. per cubic yard, while the price of ordinary brickwork on a railway contract near London in 1878, was 1*l.* 4s. 4d. per yard. Extending the comparison to earthwork, the cubic yard by Dutch labour cost 3*l.* 0s. 2d.; by English labour, 3*l.* 6s. 3d. The labour of four English carpenters would be equal to that of five Dutchmen; but the four English workmen would cost 1*l.* 6s. per day, and the five Dutchmen only 18s. 9d.,—thus making the English work 46 per cent. dearer than the Dutch."

Last summer I had the honour of being nominated the representative of the Exeter Chamber of Commerce at Paris, and whilst over there in that capacity I spent some time in making a series of visits to the principal workshops of that city, and in obtaining technical information relative to the inner life of the Parisian working man. For facilities afforded for doing this to greater advantage than I otherwise should have done, I am indebted to the courteous assistance of Sir P. Cunliffe Owen, the British Commissioner, and his kindly interest I have great pleasure in thus publicly acknowledging.

The largest builders in Paris are Messrs. Riffaud & Cie., who employ some 5,000 hands. Their masons work sixty hours a week, and receive 6½ francs, *i.e.*, 5s. 5d. a day, which is equivalent to 6½d. an hour. The masons' labourers have 4 francs, *i.e.*, 3s. 4d. a day, or 4d. an hour. These are considered high wages. Carpenters and joiners, and cabinet-makers, earn at the rate of from 4½d. to 6d. an hour; upholsterers as much as 7d., for very good men. Carvers are paid higher rates. In the best shops I found that men received payment equivalent to 7½d. an hour and upwards, the very cleverest art workmen in that branch in Paris receiving 1s. 3d. an hour, whilst several of the best men in some other leading firms were in the receipt of 1s. 1½d. These were the prices paid last summer in Paris, which, as the crow flies, is only just as far again from London as Leicester is!

Need I go further? Not only in labour, but in made-up materials, we are hearing at every hand the same thing. Retail shops are crowded with pleasantly-carved woodwork from Switzerland and Germany, quite suitable for modest domestic purposes, and all ticketed at prices we cannot compete with. Of iron and cutlery we hear a like tale. Joiners' work comes from America and Sweden, and sells at cheaper rates than we can make it for. Only yesterday a gentleman told me he had arranged to bring over foreigners to do works required upon his estate, as the "*striking*" he had endured in times past made him fear to entrust his own countrymen; whilst in Ireland, recently, a distinguished architect there told me that a German firm had been sending special gratuitous designs for altars and pulpits to hundreds of the clergy in that country, each design having the name of the church it was sent for placed upon it; the drawings showing knowledge of the individual requirements of the church whose name was upon them.

And yet, in the face of all this, we find men such as "Seagirt Albion" say they never knew a foreigner who would work for less than 1s. an hour, whilst Jno. Lewis Jaquet pats the stranger approvingly upon the back, and affirms it would be paying him a poor compliment if we thought for one moment that he could be guilty of such a shabby thing as to come over here and work at rates a farthing under his English brother!

I am neither an alarmist nor an optimist. I am English to the backbone, and believe in our ability and in our pluck. But, I cannot close my eyes to plain facts. These tell us clearly that many outside our country are trying hard to wrest the supremacy from us, and for that reason I make these remarks. To be forewarned is to be forearmed! HARRY HEMS.

THE NEW BUILDING BYE-LAWS.

AT the meeting of the Board of Works last week a report was read from the Building Act Committee stating that they had had under consideration the resolution of the Board of the 19th of July last referring to them the Metropolis Management and Building Acts Amendment Act, 1878, with instructions to report as to the arrangements necessary to be made for giving effect to its provisions. The 12th section of this Act gives the Board power to make regulations with respect to new theatres and certain new music-halls for protection from fire. The music-halls in question are those containing a superficial area for the accommodation of the public of not less than 500 square feet, to be kept open for public dancing, music, or other public entertainment of the like kind. After the making of any regulations under this section it will not be lawful for any person to keep open any theatre or music-hall coming within the provisions of this section without a certificate from the Board to the effect that the building was, on its completion, in accordance with such regulations. Any person contravening this enactment will be liable to a penalty not exceeding 50*l.* per day. The committee have prepared with great care the regulations now submitted, which have been under their consideration on several occasions, and they have throughout conferred with the superintending architect on the technical questions involved, and with the solicitor as to the powers of the Board under the Act. These regulations provide for the deposit of drawings and specifications of new theatres and music-halls, the materials and thickness of walls, and the width of staircases and passages, with the view of affording sufficient means of exit. They also contain provisions with respect to those portions and fittings of the building from which experience has shown that the damage of fire is most likely to arise. After the making of these regulations, the Board would have power to dispense with or modify the same in any special case where they might think it expedient to do so; but before the final settlement of the regulations, the committee were of opinion that it would be desirable to obtain the views of the licensing authorities in the metropolis on the subject, and they, therefore, recommended that the regulations be referred back to the committee, with authority to send the same to the Lord Chamberlain and the justices of the peace for the city of London and the counties of Middlesex, Kent, and Surrey, with a view of obtaining suggestions before they were finally approved.

The report of the committee was agreed to.

NOTTINGHAM SCHOOL OF ART.

ON the 27th ult. the medals, the Queen's, and other prizes gained by the students of the Nottingham School of Art in the national art competition and Government examinations of 1878 were publicly distributed at the Albert Hall by Sir Philip Cunliffe Owen, C.B.

Sir Philip Owen, who on rising met with a cordial greeting, said,—The Nottingham School of Art, founded many years ago, had always maintained a reputation for itself. Through a long series of years, having always had the advantage of masters noted for the excellent training which they gave, the school had come to be a glory, not only to this town, but to the United Kingdom generally. He believed that he might, perhaps, now be allowed to refer specially to results which had been achieved in the past year,—in the year 1878. He found that the Nottingham School of Art stood, as they would all read, the first in having received the largest number of medals which had been awarded. Also, he found that in the advanced Government examinations of the third grade Nottingham stood first. One of the great results of the Paris Exhibition of 1878 had been that the French had acknowledged in the fine arts, in painting, and in the arts as applied to manufacture and industry, what they termed the style *Anglaise*. People said, "We do not altogether know what it is, but it is going to be the fashion of the future." French manufacturers had spent hours and hours in the Paris Exhibition, in the English section, and, indeed, had confessed to copying many of the designs sent, because they were convinced that unless they followed in our wake, in the race of competition they would be nowhere.

The prizes having been distributed,

Mr. J. S. Rawle, the head-master, who was cordially received, said it was always his first and pleasantest duty to congratulate those students who had come off with flying colours; and if these congratulations had been most hearty in former years, they were heartier now than ever they had been before, for he had now to congratulate them upon the fact that the past year's work had shown a crowning success over the efforts of many previous years. The students had not simply come to the front once and then retired to an inglorious place in the rear, but had continued marching steadily in line, and kept for themselves the honourable position they had first won. He said that the students had made him prouder than ever at the way in which they had done their duty, and that he knew them too well to think for one moment that those who had not been victors would let their present defeats prove a damper in their determination to continue the struggle. The followers of each branch of art might learn much from each other's work; for there was not that wide gulf between the work of the ornamentist and of the artist which many so erroneously supposed. The same broad principles, the same great truths, should guide both. There was not one art for the designer and another art for the picture-maker. In a picture the mode by which the beauty of line and of form was produced was not so evident, for pictorial art should disguise the means by which the end was gained; whereas, in an ornamental design they might, without restraint, show more completely those lines and subordinate matters which led up to the principal forms. If they critically analysed a good picture and a good piece of ornamental work they would find that the same guiding principles, in a greater or less degree had influenced the construction of each, and experience proved that the greater the art power possessed by the designer the better would be his work. It was also true that a knowledge of ornamental design would prove a help to the artist. This should always be felt, and then, although pictorial art was, of course, the higher development, there would be a greater bond of sympathy between the two, which would prove a benefit to both. Ornamental art should be considered as the younger sister to pictorial art, and not be, as was often the case, banished out of the family altogether, as something unworthy of association. This union would not degrade the latter, but would certainly elevate and ennoble the former. The workers in each branch of art should remember that all good original work must be based upon what had gone before. If it were not for the influence of the past upon them they would be in the condition of the New Zealander, who, without a history to build his own experience upon, could only carry his primitive art-power as far as the carving of rude simple forms upon the prow of his canoe. If they looked back upon the past epochs of art, both ornamental and pictorial, they found, in every case, that there had been a gradual growth which, in time only, through a succession of workers, had brought about some distinctive characteristic which marked the art history of the period.

Stability of Dock Walls.—At a meeting of the Edinburgh and Leith Engineers' Society, held on the 5th inst., Mr. Robert C. Reid, president, in the chair, a paper was read by Mr. John Romilly Allen on the "Stability of Dock Walls," in which he described the methods by which failure in dock-walls might be avoided, instancing specially the necessity for the geological formation of the site being studied by means of borings taken during the progress of the work. He stated that by means of careful backing a great economy in masonry might be effected, and that the stability of the wall was greatly secured by having increased *batter* at the foot, so as to spread the pressure over a larger area at the front of the foundation, where the stress was greatest. The paper concluded by describing a new method of calculating the stress on a dock-wall.

ST. MARY'S (R.C.) CHURCH, CHELSEA.

VISIT OF THE ARCHITECTURAL ASSOCIATION.

On Saturday afternoon last a large number of the members of the Architectural Association visited the new Roman Catholic Church now approaching completion in Cadogan-street, Sloane-square, just off the southern boundary of the Cadogan estate. The new church, of which Mr. J. F. Bentley is the architect, is intended to accommodate the congregation now worshipping in the old so-called "Classic" stucco-covered building at the junction of Cadogan-street and Pavilion-road. It is Early English in style, and externally is faced with yellow stock bricks, with stone dressings, the roofs being covered with red tiles. Mr. Thomas Spooner, the clerk of the works, received the visitors, and explained the main features of the church, which on plan comprises nave, north and south aisles, chancel, lady-chapel, chantry-chapel, north transept, and on the south the chapel of the Blessed Sacrament, beyond which is the sacristy. The nave is 82 ft. long, 27 ft. wide, 55 ft. high internally from floor to underside of ridge, and 63 ft. to outer ridge. It has an arcade of four bays on each side, 23 ft. high to the underside of apices of arches, and 16 ft. 10 in. from centre to centre of columns, which latter are octagonal on plan, with shafts running up on the nave facets through the clearstory to receive the roof principals. Eastward of these four bays on the south side is a bay 9 ft. wide between the piers, devoted to the purpose of a baptistery. Opening into a corresponding bay on the north side is the northern door, the upper part of the bay being appropriated as a small private gallery for nuns, &c. The total length of the nave is 82 ft. The chancel or sanctuary is 35 ft. long by 23 ft. 10 in. wide, and is raised three steps, or about 18 in., above the floor of the nave, the height from the chancel floor to the underside of the apex of the chancel roof being 52 ft. The total length of the church internally, from east to west, is 125 ft. The nave aisles are 15 ft. wide between piers and walls. The lady-chapel is north of the chancel, and, in fact, forms the north chancel aisle. It opens by two bays into the chancel, and is lighted by two two-light windows on the north side, and by one three-light window on the east. The chantry chapel, which forms the south aisle of the chancel, opening from it, as does the lady chapel, by two bays, is the pre-existing mortuary chapel used in connexion with the old Catholic burial-ground, upon the northern edge of which the new church has been built. This chapel was built many years ago, and is not altogether in keeping with the new work. The north transept occupies the easternmost bay of the nave on that side, and is very shallow, being scarcely deeper than the width of the aisle. Opening out of the south aisle, somewhat to the westward of the chantry chapel, is the chapel of the Blessed Sacrament,—an excrescence brought from the older building already referred to. Adjoining this chapel is the sacristy, beneath which is a chamber to contain the warming apparatus. Opening out of the north and south aisles are confessional-boxes. Behind the high altar in the chancel is a narrow passage or ambulatory leading from the chantry chapel to the lady-chapel, and giving access to a staircase leading to the triforium gallery at the east end. At the north-west corner is an octagonal turret for the bell. The east window of the chancel is lofty, and consists of four lights, which it is intended to fill with stained glass. The west window consists of four lancet-lights, of equal height. The clearstory of the chancel has five lancet-lights on each side, and that of the nave has eight lights on each side, two over each of the wide bays. The only other entrance to the church besides the north door already mentioned is the principal door at the west end of the nave. The roofs of nave and chancel are somewhat wagon-headed in shape, ceiled between the rafters, all the woodwork being painted a dark bluish-green colour, the spaces between the rafters being white. Sittings will be provided at first for about 500 people, although it will be possible to seat nearly 1,000 when necessary. The stone used for piers, &c., is Stoke Ground, Corsham Down being used for almost all other work, both internally and externally. The tracery and mullions of the east window are of Hopton Wood stone. The internal walls of nave and sanctuary are finished with ashlar, the walls of the aisles, lady-chapel, and chantry chapel being finished in plaster. Messrs. Braid & Co. are the contractors. The way in which the work, especially the masonry, has been executed was commended by several of the visitors.

BRISTOL AND GLOUCESTERSHIRE ARCHÆOLOGICAL SOCIETY.

A winter meeting of this Society was held in Gloucester on the 5th inst. The programme announced that a temporary museum would be formed in connexion with the Gloucester Museum for the display of archæological objects, but the display is stated to have been a very meagre one, comprising chiefly a number of interesting old engravings of Gloucester Cathedral and Woodchester Priory, lent by Mr. Conway Jones. He also exhibited for Mr. Steed a number of "remains" found in the course of excavations in Bull-lane. Soon after eight o'clock the reading of papers commenced in the Lecture Theatre. Mr. C. J. Thomas presided.

The Rev. W. Taprell Allen read a paper on St. Briavels Castle. He minutely described the building as it now exists, and which was erected by Milo Fitzwalter, the date being generally fixed at about 1131. Since then additions had been made, as was evidenced by their different style. In 1223 there was a crossbow factory at St. Briavels, and a large order for this weapon was given by the king. In 1788 Howard visited St. Briavels Castle, which was then used as a prison; he reported that there were no prisoners there then, but recently three had been released, one having been confined nearly five years for a debt of 3s. and 4l. 11s. 4d. costs. Several interesting facts in connexion with the past history of the castle were noticed. At the present time the castle was to a great extent in a ruinous state. One tower, with the adjoining rooms, is occupied.

Some discussion followed, and an old MS. book was exhibited which had been written by monks, and was for many years in the possession of the keeper of St. Briavels.

Mr. J. D. T. Niblett read the next paper, on "The Arms of the Free Miners and Free Smiths of Dean Forest." He was glad to be able to bring before his audience a fact not generally known, though specially interesting to lovers of heraldry, which was now cultivated as a science to elucidate matters of history, it being constantly useful in fixing dates. This fact was that the fraternities or guilds of the Free Miners and Free Smiths had each their own distinctive coats of arms. They were to be seen at Abbenhall Church, about a mile from Mitcheldean. He then described the church and the eight shields on its font, and exhibited coloured diagrams of them, giving explanations of various details in connexion with them.

In the brief discussion which followed, Sir J. Maclean suggested whether the shields in question, which were peculiar in bearing tools upon them, were not rather trade marks than coats of arms.

The Rev. W. Bazeley read a paper on "The Earls of Gloucester," in the course of which he said:—Foremost amongst the Conquerors' nobles was his kinsman Robert Fitz-Hamon. On the death of Queen Maud in 1083 her lands and rights, including the "honour" of Gloucester, should have passed to Henry Beauclerk, her youngest son, but William Rufus gave them in 1087 to Robert Fitz-Hamon. 1091, Jestyn, lord of Glamorganshire, having been defeated by Rhys ap Tewdor, prince of South Wales, applied for help to the nobles of England. Fitz-Hamon and other knights went to his help, and Rhys ap Tewdor having been slain, the English nobles quarrelled among themselves, and Fitz-Hamon took possession of the province of Glamorgan. In 1102, at the instance of his wife, Sybil, daughter of Roger Montgomery, Earl of Shrewsbury, and of Gerald, Abbot of Cranbourne, Fitz-Hamon re-built the priory church of Tewkesbury, and endowed it with vast possessions. William of Malmesbury says, "It cannot be easily reported how highly Robert Fitz-Hamon exalted this monastery, wherein the beauty of the building ravished the eyes and the charity of the monks allured the hearts of such folk as used to come thither." The lofty receding arch at the west end of the present church, and the massive Norman tower, were relics of Fitz-Hamon's munificence. Fitz-Hamon and his successors lived at Cardiff with little less than regal splendour, and two towers of the present Castle of Cardiff were parts of this noble structure. He accompanied Henry I. to Normandy, fought with him at Tenchebrai, and at the siege of Falaise he was wounded with a spear, which drove him mad. He died in 1107, and his body was brought to England and buried in the chapter-house at Tewkesbury. In 1241 Robert, the third abbot of that name, removed the bones to a tomb which he had had constructed for them on the south side of the choir; and 150 years later, Thomas Parker, the eighteenth abbot, raised a chapel of carved stone above Fitz-Hamon's new resting-place, and ordered a mass to be sung there daily for the repose of his soul. Mr. Baseley then went on to narrate at length the history of Robert de Caen, Earl of Gloucester, eldest son of Henry Beauclerk, and Nesta, daughter of Rhys ap Tewdor. During the latter years of King Henry's reign, Earl Robert rebuilt the Castle of Bristol, and gave every tenth stone to the monks of St. James's Priory for the chapel of St. Mary. Together with a palace and other houses, he built a magnificent keep on the north-west with stones imported from Normandy, and encompassed the whole with a strong and lofty wall. Mr. Bazeley gave an interesting sketch of the long and disastrous struggle between Stephen and Matilda, and described the important part taken in it by Earl Robert, and the various scenes connected with the conflict which were enacted in Gloucester and Gloucestershire.

The concluding paper was by Mr. J. H. Cooke, on "The Great Berkeley Law-suit of the Fifteenth and Sixteenth Centuries."

THE ART-UNION OF LONDON.

At the present time, when retrenchment is the order of the day, it was a judicious step on the part of the Art-Union to select, for their annual presentation work, an illustrated book, since many a subscriber, desirous of not losing the advantages attached to continuous payment, might manage to spare a guinea, when he would be alarmed at the further (prospective) disbursement required for a frame and glass, if a large engraving were to be the return for his outlay.

The subject of the work in question is Lord Byron's tale of Lara, and the designs are by Mr. C. B. Birch.

This poem, it is stated, was chosen for illustration on account of its presenting a large amount of dramatic incident within the limits best suited for a work of this character; thus facilitating the aim of making a series of designs which should, as far as possible, tell their own tale. In addition to this, great advantages are offered by the costume and architecture of the probable period suggested. Mr. Birch is already favourably known to the subscribers by his statuettes "A Wood-nymph" and "Whittington." The original marble of the former, life-size, given in 1872 as a prize by the Art-Union, was selected as one of the works to represent British sculpture at the Paris Exhibition.

The salient points of the story have been picked out for illustration, and the treatment is spirited and the drawing good, the somewhat statuesque manner occasionally indicating the sculptor's hand. The book, now ready for delivery, will be a welcome addition to the series of similar volumes already produced by the Society. It is to be noted that the subscription must be paid before the end of March. The annual meeting will be held at the Lyceum Theatre on the 29th of April, and it is announced that, amongst the prizes then to be distributed, will be a number of busts, in porcelain, of H.R.H. the late Princess Alice, for which, by special permission of the Queen, Mrs. Thornycroft has made a reduced copy of the original bust of the Princess.

ACTION FOR FEES.

Royal Institute of British Architects,
No. 9, Conduit-street, London, W.
Feb. 12, 1879.

Sir,—The Council have had their attention directed to an error, relating to themselves, in the *Builder* of the 1st inst. At p. 130 (third column), in the report of an "Action for Fees," it is stated that "Mr. Francis, architect, and *a member of the Council of the Institute*, corroborated, &c." We are instructed to inform you that Mr. F. J. Francis, of 34, Old Broad-street, E.C., was a member of the Council before the changes made in May, 1877, but that at the present moment no gentleman of that name occupies a seat at the Council of the Royal Institute of British Architects; and we shall be obliged if you will permit this correction to appear in your next issue.

T. H. Wyatt, Hon. Secretary.
William H. White, Secretary.

THE OBELISK.

THERE has been another little collision on the question of inscriptions between the Metropolitan Board of Works and the gentlemen to whom London is indebted for the Obelisk. Without asking now who is right and who wrong, we implore all concerned to try and agree, so that the monolith may take a more creditable form than it at present displays. Placed as it is on its built-up pedestal of modern granite work, with which it has not the slightest connexion, and exposing its ugly rounded end, it looks like one of a set of huge skittles that has lost its way, and is fast ceasing to be suggestive of anything but a sneer, a jeer, or a fear. It is not clearly understood what is intended to be done to give a somewhat monumental aspect to the at present incongruous erection, but we conclude, as a matter of course, that some metal-work is to be applied at the four angles of the base of the Obelisk, and that some metal panels will find a place on the pedestal, so as to connect the two, if ever so slightly. This ought to be done at once: the whole affair is drifting into disrepute.

ARCHITECTS' AND SURVEYORS' CLAIMS.

Two claims of this character came before the Whitechapel and Shoreditch County Courts respectively last week.

In the first-named court, Mr. Sanders, architect and surveyor, of Southampton-street, Bloomsbury-square, sued Mr. Williams, a gentleman residing at Woodford, in Essex, to recover the sum of 19*l.* 18*s.*, the balance of an account for surveying and superintending the building of houses situated in Latchett-road, Woodford. The defendant had paid 6*l.* into court, contending that that sum was sufficient for the services which the plaintiff had rendered, and that the charges were excessive. On the other hand, it was urged that the charges made were reasonable, and the judge gave a verdict for the full amount claimed.

In the case tried at the Shoreditch County Court, the plaintiff, Mr. Michell, is a surveyor in Moorgate-street, and the defendant, Mr. Beale, resides at Grove House, Cambridge-heath. The action was brought to recover 5*l.* 5*s.* for fees and expenses, and the plaintiff's case was that he was employed by the defendant, who had just completed some houses at Forest-gate, to go through a number of accounts, measurements, and quantities in connexion with the building of these houses, and which at the time formed the subject of an action at law. He had also been called in to perform these services in order that he might appear as a witness in the case, and be able to say whether the charges were fair and reasonable. The defence was that the plaintiff was called in merely to say whether the charges for material were correct or not, and that it was no part of his business to go to the estate and test the measurements. On the part of the defence, witnesses were called to prove that it was impossible the plaintiff could have gone through the measurements; but the judge said it was unreasonable to suppose that a man could be expected to become an important witness in such a case unless he had examined the buildings and tested the measurements. As he appeared to have been over-paid with respect to one item of his services, he should give the plaintiff a verdict for 2*l.* 2*s.*, with costs.

THE BURSTING OF WATER-PIPES DURING FROST.

SIR,—Allow me to offer, for what it is worth, a contribution to the literature of burst pipes. I have always held, as matter of self-evident truth, the view to which you admit that you have inclined, namely, that the frost bursts the pipes, and the thaw discovers the damage. The caprice with which flaws occur has, indeed, been a puzzle to me as well as to others, and I cannot but feel gratitude to your correspondent, "W. Wyatt," for the extremely probable explanation that he has given of at least one cause of the apparent caprice. This is all that I should have been able to say on the subject a month or two ago; but in the first sudden and violent frost of the present winter, I, in common with most of my neighbours, had to send for the plumber. A rupture of the capricious nature last noticed had occurred in a service-pipe which was easy of access. The ball-cock that supplied the cistern above was frozen hard. I called for boiling water to thaw it. "Not boiling, sir," quoth the plumber; "only warm." "Why surely," I replied, "the hotter the better." "No, sir," says the other, "boiling water bursts the pipes, warm water thaws them and does no harm." "All the harm," said I, "is done already, depend upon it. It is the expansion of the water in freezing that cracks the pipes; hot water or warm water can only show the damage that has been done before." "Well, sir," said the plumber, "you do as you like; but I can tell you that when I have used boiling water for thawing a pump, I have heard the bolts crack and seen the nuts fly off when it was poured on; but I never saw any damage done by moderately warm water."

Now, sir, this is only second-hand evidence as far as my communication to you is concerned. But it was a statement seriously made to me by a respectable tradesman, evidently in earnest, who spoke of his personal experience in his own trade. I do not see how he could be mistaken. I feel no doubt whatever that he said what he believed. Of course, I acted on his advice, and I had no trouble with the ball-cock. I cannot attempt to explain the theory, on the assumption that the statement is correct. The subject is one involving so much discomfort and expense to so many householders that I make no apology for bringing before you the statement exactly as it was made to me. Perhaps some of your numerous readers may be able to add something of value, either in support, in contradiction, or in explanation of the plumber's dread of boiling water.

C. E.

SIR,—During the late frost, some of your correspondents discussed the cause of the bursting of water-pipes during a frost, and, if I remember rightly, some contended that the damage was caused by the thawing of the ice. If not too late, you may like to insert the enclosed extract from Professor Huxley's admirable work, "Physiography," which I had not by me at the time you published the correspondence. I suppose he may be considered an unequalled authority on such matters:—"It is important to note that water and a few other liquids, instead of continuing steadily to contract when cooled, reach a limit at which contraction stops and is succeeded by expansion, so that the solid water actually occupies a good deal more space than did the liquid from which it was derived. When a water-pipe bursts during a frost, or a jug of water cracks as the liquid freezes, we are practically taught that water, during the process of solidification, undergoes a large increase of bulk."—P. 56.

E. S. R.

PARTY WALL QUESTIONS.

As it was I who raised these questions, I shall be glad to reply to Mr. Amery's letter in your last issue. The first case which he mentions has no bearing whatever on the subject of party walls, for a wall which he desires to build entirely upon his own land, and belonging exclusively to his own house, is not a party-wall, but an external wall. In building it he must, of course, keep quite clear of his neighbour's soil, taking such steps as he may be advised for getting a sufficient foundation with as little sacrifice of space outside his wall as possible. Practically,—if no party-wall is built,—he and his neighbour will, no doubt, build their walls close together, seeing that there is a good foundation extending under both walls. But they had much better agree to build one wall only which will stand over the junction line of the two properties, and having proper footings. This will be a "party-wall" of which they will be tenants in common, and, if within the Metropolitan district, the law in relation to it will be found in the Metropolitan Buildings Act.

With regard to his other instance, one cannot help seeing that by selling the whole of his building plot, except the strip of 7 in. wide on which stood one half of the wall, he raised some nice questions, and may be glad to have got out of his difficulty so easily. I should say the wall was not, when he sold his house, a party-wall, though it may be one now that the new proprietor of the adjoining land has paid a consideration, and has used it. Your correspondent is, I suppose, still the freeholder of the 7-in. strip, and if he had bought and built on the adjoining land he could not have sold his new house without producing his title to this strip as well as the title to his new plot. If the owner of the house last built wants to sell, he cannot produce any title to the strip. He is, however, not before us.

THOS. BLASHILL.

BAD BUILDINGS.

SIR,—The only effectual remedy will be to make the ground landlord jointly responsible with the speculating builder for the proper materials being used in the construction of buildings. The evil lies at the fountain head.

Most of these landlords do not employ a surveyor to look after their interests, and bind down the builder, as to the materials, under penal clauses; but employ a speculating man to cover the ground at the least possible cost. "*Qui facit per alium, facit per se*," is a legal maxim that might be applied with great benefit to the general public; and the builder in these cases is simply the agent of the landlord.

No amount of legal pressure applied to these builders can abate the evil,—fighting such a class is fighting with shadows,—here to-day, gone to-morrow.

If acting in the landlord's interests, I would not allow such a thing as an angle quoin supported by an iron column. Such quoins should all be well splayed, and good story-posts fixed in addition to such columns.

Further, I think it is a question whether the walls of all dwelling-houses should not be a brick and a half, or 14 in. thick, in place of the 9 in. work at present allowed, as the bond of this is imperfect, and it will scarcely keep out the weather.

A DISTRICT SURVEYOR OF THIRTY YEARS' STANDING.

P.S.—Power should be taken either by bye-law or amendment of Act (short Act), by the Board of Works, enacting that,—"The term 'builder' shall apply to and include any building owner, ground landlord, mortgagee, or other person interested in such land or houses"; otherwise it is a question of supply and demand. Bad builders will always be present to do cheap building and cheat the public, and the nuisance will continue, and the real offenders escape punishment.

BUILDERS' CONTRACTS.

IN your impression of the 1st inst. I noticed an article stating that the first annual meeting of the National Association of Master Builders took place at Leeds, on the 23rd ult., about seventy representatives being present. Amongst the things discussed and approved of was a new form of contract which had been prepared and recommended by the committee for general adoption throughout the building trade, the contract to be based upon the conditions of contract agreed upon by the Royal Institute of British Architects and London Builders' Association. Now, though I am not a builder myself, but clerk to a builder, I think, on behalf of the builders who do not belong to the above association, I am entitled to ask a few questions on the subject of the new conditions recently imposed by the architects. In the first place, I would ask the Association of Builders why the condition of depositing a *fac-simile* priced copy of quantities before signing the contract should be enforced? The architect's answer is, to insure a more amicable settlement. In what way? Simply by charging all extra work, and deductions, if any, at contract prices. I would ask, who is to pay the builder for the extra labour in cutting away and making good after extras, if you are bound up to the contract prices? And under those conditions an architect might alter the whole arrangement of a house, and put the builder to great expense. Still, you must only have the prices that you put in low competition for the job; that is a condition, I think, that all builders of repute should oppose, as a sealed copy of quantities is not always secure, even in the hands of architects, and the builders who deposit same are making a rod to be used against them. Another very stringent condition is that all materials carted upon the works are to be the property of the person for whom you are carrying out the contract, and not to be taken away without a written order from the architect; also not to sublet any of the work without a written order from the same person. The first reads in this way. If you carry twenty loads of timber on the works, and only use fifteen, you must get an order to remove the others. The second I consider is an imposition, as all builders sublet more or less of their work.

The above comments are made upon a copy of conditions I have just perused, trusting that some member of the Builders' Association will give me his views upon it.

Builder's Clerk.

FROST AND MORTAR.

Sir,—The winter of this year 1878-9 is, I take it, almost a counterpart of that of 1860-1 in its severity. In that year the building of the brick-work of a church about 8 ft. above ground level was so severely injured by the frost that it was condemned, and had to be rebuilt.

The matter was attended with litigation, and it was sought to be proved that defective materials had been used; but the result showed that good materials had been used, but the action of the frost had reduced the mortar to powder, and made it perfectly worthless.

The moral is that the rotten appearance of mortar after being acted on by frost may be mistaken by the uninitiated for defective work, and that it is better to defer all work (not always possible, however) during a frost.

A District Surveyor.

SANITARY SUPERVISION.

Sir,—As I have for many years been engaged in practical sanitary house reform, I have watched the changes of public opinion on sanitary matters, and I can testify that your journal has kept well to the front in guiding that opinion into proper channels. I have derived many useful hints from the letters and articles appearing in your publication, but I think the time has come when suggestions and experiments ought to merge into ascertained and acknowledged facts. If sanitary engineers have not now sufficient experience and data to enable them definitely to determine on the best and simplest system of sanitary arrangements for houses, they will never come to any decision at all, and universal sanitary reform will be further postponed until the general body of sanitary engineers agree to adopt some approved system of sanitation.

Your correspondent, Mr. Buchan, has rendered good service to practical sanitary engineering, especially in introducing and advocating his excellent form of trap for at once excluding sewer gas while admitting pure fresh air to house-drains and soil-pipes; but Mr. Buchan rushes too readily into print, and if he confuses your readers with many more suggestions such as those in his letter which appears in your issue of February 1, they will have to give him up.

As a practical man, I heartily approve of Mr. Buchan's former suggestions, of which he freely gave the public full benefit, but I utterly condemn as absurd and impracticable his "new plan." The "open trough" on the branch soil-pipe which he therein strongly and unadvisedly advocates is so objectionable and impracticable that I am in doubt how I can ever trust to his advice again.

1st. It would present an abominable appearance (especially when in action) viewed from any windows on a higher level, whether in the same, in an adjoining, or in an opposite house.

2nd. It would be offensive to the sense of smell.

3rd. It would injure the appearance of the house.

4th. It would deteriorate the upward draught of air through all lower parts of the soil-pipe and at the inlet trap.

5th. In certain winds blowing down upon these "open troughs," a powerful and offensive down-draught would be driven out at the inlet grating over trap at ground.

6th. Heavy snow and frost would fill up and choke the "open trough," and the soil would then unquestionably overflow and pour down the sides of the house.

There is an excellent system of sanitary arrangements well known and well tested by sanitary engineers of practical experience which, if faithfully carried out, supplies all real wants; we do not want even to breathe the air of our house-drains, nor to render our soil-pipes fit places to live in. Our one object should be to exclude, by the best and simplest means, all dangerous sewer gases from our dwellings.

I have originated and am successfully carrying out a system of sanitary house inspection, guarantee, and insurance, which you may consider worth communicating to your readers, as they may find a similar system work well in their districts, and I, therefore, enclose one of my prospectuses. I find the system works smoothly and well in this country (Dublin), and it enables householders at once to strike at the root of defective drainage.

Wm. Robt. Maguire.

HOTELS AND RESTAURANTS.

Sir,—Through the medium of your journal may I be allowed to supplement by a few remarks Mr. Frederick Francis's paper (p. 155, *ante*) on this subject, read before the Architectural Association? Referring to the "art-tiles" employed as decoration at the King's Head, may I, as one of the two actual painters of this work, be allowed to state that I have just designed and painted those additional portions rendered necessary by the enlargement of the premises in Mark-lane?

I must here acknowledge the name of the other painter, M. Alexandre Gravier, who, in the original and largest portion of the work, designed and painted those tiles constituting architectural arrangement, flowers, birds, fruits, &c., the sole painter and part draughtsman of the entire historical, Shakspearean, and other subject-work being

Isaac A. Gibbs.

Royal Scottish Academy.—At a general meeting of the Royal Scottish Academy, held on Monday, Messrs. James Cassie and Robert Gavin, Associates, were elected Academicians, in the room of the late G. P. Chalmers and Kenneth Macleay.

ST. ALBAN'S ABBEY.

THE NAVE ROOF.

Sir,—"An Old Friend," in last Saturday's *Builder*, hints that it is rather "low,"—a sign of rusticity,—to care about ancient buildings. Doubtless there may be reasons therefor. So skilful an artist in throwing cold water can hardly be ignorant of his own perfections. The bits of innocent ignorance in his letter have, therefore, a suspicious look, but I will not be deterred from following my first benevolent impulse. I was really distressed that so comely-spoken a gentleman should talk of "conservative restoration, whatever that may be," and thought you would allow me to define the creed of the conservative restorer, so that when "An Old Friend" writes again on the subject he may be a trifle less vague. I do not think any orthodox member of the body will quarrel with the following six rules:—

1. An old building had better not be meddled with, unless it is going to ruin, or has been much injured by neglect or wilful mutilation.

2. Any old work of merit which wants repair should be repaired.

3. No old work of merit should be destroyed merely in order to put new work in its place.

4. If some part of a building, actually in use, is so far decayed that it must be renewed, the new work should, as a general rule, be a careful copy of the old work.

5. If ruthless people have injured the beauty of a building by depriving it of something which once belonged to it, this something may be replaced or restored.

6. If the original form of any part of a building cannot be discovered, conjecture and analogy may be useful,—if it is impossible absolutely to let the work alone,—but in no case must anything be put up which *could never* have existed at any previous time.

What is proposed at St. Alban's will sin against the spirit of the whole of these rules. A sound, substantial, old oak roof is to be destroyed,—merely to put up a new fir roof such as never existed before over Decorated bays. We have practised restoration of ancient buildings for a long time, and on a good scale in England, and have preached abroad the true kind of restoration, and denounced the false. Are we now to take it that persons in authority do not care in the least which is followed for the future?

Another Old Friend.

Sir,—I will ask you to publish a letter I addressed lately to Mr. Street, and this, I hope, will be my last contribution to the correspondence:—

[Copy.]

"Spring Gardens, January 31, 1879.

Dear Mr. Street,—I was in Wales when your letter came, or I should have replied sooner.

When you first made the attack on our proposal, I felt that your position, and the prominence given to your criticisms, made it desirable that I should reconsider the ground on which we were acting.

This I did with the greatest care, proving to the satisfaction of myself and the Committee that the addition of a high roof was both justifiable and on every account advantageous.

Having done this, I have no intention of reopening the question a second time.

The method adopted for ascertaining the probable ancient line of roof is the most trustworthy I know of, and I have every reason for feeling confidence in the substantial correctness of my conclusions. J. Oldrid Scott."

As regards the desire which my father had to add a high roof to the nave of St. Alban's, I wish to point out that it is proved, beyond all doubt, by his repeated conversations, and by his correspondence with his clerk of the works, Mr. Chapple. It is in a letter to him that the idea of repeating what he had done at Selby is mentioned. Again, he expressed his wish most distinctly to Mr. Longmire, the contractor, as well as to others, and especially the chairman of the committee, Lord Verulam, to whom he stated that he should rejoice to add a high roof, only he despaired of the necessary funds being ever available. There is also the evidence of his original report, in which there is a passage exactly to the same effect; so that there cannot be the slightest doubt that, in his opinion, the addition of a visible roof would be a vast gain to the building, and that he would have been most pleased to carry out such a work of restoration.

For my own part, I am rejoiced to know that in what we are now doing we are only carrying out the wish of one whose opinion on such a question will be admitted by all to be of the highest value.

J. Oldrid Scott.

SURVEYORS' FEES.

Sir,—In your issue of the 1st inst., I notice report of an "Action for Fees—Gordon *v.* Blackburne," which, you say, involves a question of considerable importance to architects and quantity surveyors. The decision, in this case, apparently, was that an architect is liable to the quantity surveyor for his fees. If this be the case, the decision is contrary to at least two other cases, lately decided in England and Scotland. As we are not all at one as to the meaning, or, rather the effect, of this decision, would you kindly permit me a few words?

The jury in this case found for the plaintiff (Gordon, the quantity surveyor), on the ground "that the plaintiff was employed by the defendant personally, defendant acting as principal," but the judge lays down the law plainly in saying to the jury,—"But if the jury should find that there was only the ordinary relation of architect and quantity surveyor between defendant and plaintiff, and that defendant acted for a disclosed principal, then the verdict would be for the defendant."

It fairly follows that, unless there had been some other than ordinary relation (which the jury found there was) between architect and quantity surveyor, the decision would have been for the defendant (Blackburne, the architect).

The English case (Gwyther *v.* Gage) referred to above, is reported in the *Times* of February 8, 1875. It was before Mr. Justice Quain and a jury. Here the plaintiff (Gwyther, a quantity surveyor) sued the building-owner for his fees, charged on the lowest of the tenders sent in from his schedules. The defendant refused payment because "the architect in the present instance had only a limited authority, and that he was told that the defendant had engaged a builder, so that there would be no necessity to take out the quantities to enable the builders to tender." His lordship said that if the jury found that the architect's authority was not limited in the way stated, the defendant was liable to pay the plaintiff a reasonable remuneration for taking out the quantities. The jury returned a verdict for the plaintiff, and the judge assessed the remuneration at 1½ per cent. on the lowest tender.

The Scotch case is from the *Scotsman* of January 25, 1879. It was before three judges of the Court of Session. This is a cutting from the newspaper:—

"SECOND DIVISION.

APPEAL—WILLIAM CORNELIUS *v.* EDWARD BLACK.

This was an appeal taken from the Sheriff Court of Edinburgh in an action raised in that court at the instance of the respondent Black, who is an ordained surveyor in Edinburgh, for the payment of 82*l.* 8*s.* 3*d.* The sum sued for was the amount of an account incurred to the pursuer for certain measurement work on buildings which the appellant Cornelius, who is a painter and decorator, Hanover-street, Edinburgh, proposed to erect in Angle Park, Dalry. The pursuer was employed to do the work by the architect of the defender, and the defender, on that ground, pleaded non-employment and consequent non-liability.

After hearing evidence, the Sheriff-Substitute (Hallard) gave decree against the defender, holding that the architect's employment was the employment of the defender, by virtue of a constant and uniform custom of trade.

The Sheriff (Davidson) affirmed the judgment of his substitute.

To day their Lordships affirmed the judgments appealed against, and gave the respondent and pursuer additional expenses."

I may add that the sheriff, in his interlocutor, says "that the pursuer's claim is supported by constant and uniform custom of trade," and in his note "the equity which underlies that practice is, that the surveyor's work is done for behoof of the owner with the owner's knowledge." To take up as little of your room as possible, I will only say further that these three decisions appear to me to be virtually the same.

Ordained Surveyor.

OPEN SOIL-PIPES.

Sir,—In reply to your correspondent's letter in last week's *Builder* as to how the open soil-pipes had fared during the recent long-continued frost, I have much pleasure in assuring him that I have not had the smallest trouble. During the last three years I have had a number carried out on my plan, and though since the frost set in I have not been able to get reports from all, yet I have heard of many, and amongst them have not had a single complaint. I think I may infer that those I have not heard about are all right, for had anything gone wrong the chances are I should have heard of it. As a rule, we hear pretty soon of our failures!

For those in my own house I can personally vouch. We have not had the smallest trouble. They have been in constant use, and have had no special attention paid to them. We have been content with the daily evidence that everything was going on well. The soil-pipes have now been in use for three years, and are quite inoffensive, and the closets singularly sweet.

I have heard of a great many people complaining of the "wastes" from their sinks freezing, owing to having adopted the "disconnexion plan." All that I can say is, that we have five in use (four sinks and a lavatory bason) and we have not had the least trouble. Remember there are no lead traps nor brass gratings to check the flow of water. The water runs direct from the sink through a short length of pipe into an outside cistern head, and from that down a vertical pipe into the underground syphon trap. I find that eight gallons of water run off easily in from eighteen to twenty seconds. R. NORMAN SHAW, R.A.

THE CRACE COLLECTION: OLD LONDON.

THE collection of maps, plans, and views of London and Westminster, made by the late Mr. Frederick Crace, and lent to the South Kensington Museum by his son, Mr. J. G. Crace, as already stated, is now on view daily in two of the upper rooms in the galleries on the west side of the Horticultural Gardens. Admission is free on Monday, Tuesday, and Saturday; on the three other week-days on payment of 6d. The plans and views selected from the collection for exhibition are 3,085 in number. A complete catalogue, compiled from Mr. Crace's larger work, is to be had for 6d.

DRAINAGE WORKS.

St. George's Sanitary Authority, Gloucestershire.—The Sanitary Authority having applied to the Local Government Board for sanction to borrow 3,577*l.* for new drainage works, the Government Inspector, Colonel Ponsonby Cox, R.E., held an inquiry meeting at the offices of the Authority last week to receive evidence of any persons interested in the matter, and to examine the plans and sections, which have been prepared by Mr. Wm. Dawson, C.E., the Board's surveyor. No opposition having been offered, the inspector decided to report favourably upon the scheme, so that the works will be commenced shortly.

Silsby.—An inquiry has been held by Major Hector Tulloch, R.E., upon the application of the Barrow-on-Soar Rural Sanitary Authority, for a loan of 3,500*l.*, to be expended for drainage works at Silsby. It is proposed to purify the sewage by filtration on eight acres of land. Messrs. Hodson, Price, & Hodson, of Loughborough, are the engineers.

Derby.—The Urban Sanitary Authority have instructed their borough engineer, Mr. Clement Dunscombe, C.E., to prepare a complete scheme for the disposal of the sewage of the borough, so as to comply with the requirements of the Rivers Pollution Act.

MASTERS AND MEN.

Edinburgh.—At a meeting of the master plasterers of Edinburgh on the 6th inst., the question of wages was fully considered. The meeting was of opinion that as other skilled workmen in the building trades had recently had their wages considerably reduced, and as 7d. per hour was the maximum payment now made, plasterers should, on and after Monday last, be placed on the same footing, and that, therefore, their wages should be reduced to 7d. It was also resolved that labourers be reduced to 5d. per hour.

Preston.—The Preston stonemasons returned to work on Monday morning, on the masters' terms,—a reduction of 4*s.* a week, within a fraction.

Glasgow.—About 250 plumbers in Glasgow, who have been on strike for six weeks, agreed on Monday to accept a reduction of 1d. per hour on the present rate of 8½d.

Welsh Slate Quarries.—Notices of a reduction of working days to three weekly, and of 25 per cent. reduction in wages, were posted on Monday at Llanberis slate quarries. The Bethesda quarries are only working four days weekly.

BUILDING SUMMONSES.

AT the Wandsworth Police-court, before Mr. Paget,

Mr. Charles Kent, a builder, was summoned for erecting an iron church in Queen's-road, Battersea, without giving notice to the Wandsworth Board of Works.

Mr. Pilditch, the Board's surveyor, said he made several applications for the notice, but he could not obtain it, and it was not furnished until the building was nearly finished.

The defendant said he was not aware of the existence of a local Board. He had put up several iron churches in Wandsworth, and the post had never risen before.

Mr. Paget pointed out to him that seven days' notice was required before commencing the work. He fined him 40*s.* and 2*s.* costs.

Mr. Paget heard three summonses against Mr. Snelling, Mr. Bryant, and Mr. Collis, all builders, carrying on works in Northcote-road, Battersea, for causing an obstruction by placing their materials on the road and footpaths.

Mr. Corsellis said the builders in that neighbourhood appeared to do what they pleased with the public streets.

Mr. Paget fined each of the first two defendants 40*s.*, and the other 2*s.*, with costs.

GRANITE PAVING.

SIR,—We notice in your valuable periodical of the 18th ult. a letter from Mr. Allison, borough surveyor of Bradford, in which he disparages somewhat the blue Penmaenmawr sett as a paving material. It is only fair to state that though the hard blue stone complained of does come from Penmaenmawr, yet there is another quarry there which produces an entirely different material, being of a grey colour, and of an excellent grain calculated to furnish the foothold so absolutely necessary in city paving.

This material is known as "Darbishire's Granite," and as we have used considerable quantities in the construction of the Preston tramways, we write with authority as to its excellence.

We may mention one telling fact, namely, that after having laid the tramway on a macadam road out of Preston, most of the ordinary traffic immediately made use of the paving in preference to the macadamised part of the road on each side. JAY & Co.

SHARP WORK.

SIR,—The following example may serve to show the "happy despatch" with which competitions are sometimes conducted.

On the 1st of January, 1879, particulars were issued for a Wesleyan chapel at Matlock Bridge, designs to be delivered not later than February 1st. These being received, a post-card is sent to competitors informing them that 183 applications had been made; 85 sets of designs received, and two selected therefrom.

Now the post-card is printed, and dated Feb. 6; it was therefore printed a day before, and Feb. 2 was Sunday, when, of course, the designs were not looked at. There remain, at most, three working days in which to examine and reject eighty-three designs, and to choose two! What a massacre of the innocents!

Architects are generally anxious to know the fate of their designs as early as possible, and this time they must be gratified. T. N. L.

Books Received.

Text Book on the Steam Engine. By T. M. GOODEVE, M.A. London: Crosby Lockwood & Co. 1879.

THE author points out the influence which the change of view of the nature of heat has exercised in the construction of the steam-engine and the manner in which Watts's "diagram of energy" has enabled a scientific analysis of the action of heat-engines to be made, and particularly the action of the steam-engine. The first chapter contains a sketch of the steam-engine as it existed in the time of Watt, together with an account of the ideas then prevalent as to the nature of heat; the second and third chapters exhibit the principles of the modern theory of heat; the fourth deals with some salient points in the mechanism of an engine; the fifth is on the expansion of steam, the action of valves, and the application of Watts's indicator; the sixth, on boilers and the consumption of fuel; the seventh, on compound cylinder engines, illustrated by drawings; and finally, a chapter on miscellaneous details. The work concludes with a series of examination questions.

A Treatise on Coal, Mine Gases, and Ventilation. By J. W. THOMAS, F.C.S. London: Longmans, Green, & Co. 1878.

THIS volume treats on the formation of coal, its microscopical appearances, the gases in coal, its deterioration by exposure to the atmosphere, the properties of matter. Of atmospheric air the author says that "its pressure upon a working face of coal—perhaps 1,000 yards long and 5 ft. deep—must be enormous. Now, a reduction of 1 in. of barometric column, or, in other words, an equivalent lowering of the atmosphere, would materially reduce the pressure, which is much more perceptible when divided over a large area. It will be seen, therefore, that when a portion, say 1.30th (if the barometer lowered 1 in.), of the pressure is removed, extending over so vast an area, the amount of gas which would be liberated in consequence must be, necessarily, very large. The height of the atmosphere determines the withholding or releasing of gas or fire-damp, and it behoves much care and watchfulness on the part of colliery officers when a sudden lowering of the barometric column takes place."

The author's diction is not happy, but we quote his words, because we think, from his position, that he is capable of throwing some practical light on a subject which just now largely engages the attention of people in mining districts.

Other chapters are on Hydrogen, Carbon, Compounds of Carbon and Hydrogen, Sulphur, Explosions in Coal-mines, Combustion, and Ventilation; with an Appendix on the Gases enclosed in Coal, reprinted from the Journal of the Chemical Society.

Miscellanea.

Mr. Charles Barry, President of the Royal Institute of British Architects, has been elected an Honorary Member of the Imperial and Royal Academy of Fine Arts of Vienna, "to give expression" by that body "of their esteem for his artistic career." A similar compliment has been paid to a few well-known members of the Royal Academy.

British Museum.—The British Museum is now open free to the public on every week-day,—Monday till Friday from ten o'clock, and on Saturday from twelve o'clock till the ordinary hour of closing. Special arrangements have been made to enable students to carry on their work without interruption. Students of natural history will have Tuesday and Thursday reserved for their studies, students of archæology Wednesday and Friday. Only on Monday and Saturday will the public be able to view the whole of the collections; on Tuesday and Thursday, all except the natural history specimens; and on Wednesday and Friday all except the Greek and Roman sculptures, and antiquities in the upper gallery. Tickets will be granted to readers and students without limit of term, but subject to withdrawal. The actual presentation of the ticket will not be considered necessary for entrance into the reading-room, &c., but the holder when not known to the door-keepers will be asked, for the purpose of identification, to write down his or her name and address. Arrangements are also being settled for an experimental lighting of the reading-room of the Museum with the electric light.

City Free Museum.—An addition has recently been made to the interesting collection of antiquities at this place, Mr. H. Bird having presented to the Corporation the corner-stone of St. Michael's Church, Queenhithe, which was pulled down some time since. The stone has upon it the following inscription: "This chvrch was bvrn'd in ye dreadful fire in ye yeare 1666, and was began to bee rebvilt in ye yeare 1676. Will. Woodrof, Tho. Lyme, Chvrch Wardens." On a leaden tablet it is recorded that "Sir John Lawrence, Knt., alderman of this ward, laid this stone 10 March, 1676."—*City Press.*

The Artisans' Dwellings Act.—It is understood (says the *Sheffield Telegraph*) that Mr. Cross contemplates the extension of this Act to the smaller towns. "At present the measure can only be put in force in towns possessing a considerable population, and it is felt that in many of the country towns its provisions are as much required as in the great cities. Its extension will be generally supported by all parties in the House of Commons, and will give great satisfaction to the smaller municipalities. The measure, in all probability, will form a prominent feature in the Government programme for the year."

Lectures on Architecture.—Mr. T. Roger Smith has just concluded a short course of lectures on Architecture, at the School of Military Engineering at Chatham. He has illustrated these by a method which was somewhat novel, for in addition to the usual diagrams, &c., "lantern illustrations" have been employed. That is to say, photographic views of buildings have been magnified and thrown on to a screen by the electric light, with the aid of a large magic lantern. Upwards of 150 buildings, or parts of buildings, have been by this means shown, in a manner at once accurate and brilliant.

The Proposed Building Regulations for Glasgow.—The inquiry into the provisional order which is being promoted by the Corporation of Glasgow for the better regulation of the building operations was resumed on the 5th inst. The evidence for the promoters was exhausted, and the inquiry was adjourned until the 6th inst., when the evidence for the objectors to the order was heard. The evidence was generally to the effect that the changes sought to be introduced were in many cases unnecessary, even from a sanitary and hygienic point of view, while the loss which would result to proprietors if the changes were to be carried out were of such a nature as demands compensation. Mr. Honeyman, architect, considered the proposal to make the minimum height of ceilings 10 ft. instead of 8 ft. a mistake. The room with the higher roof would have less floorage, and would be altogether less healthy and comfortable than a room with more floorage and only 8 ft. in height. Even so far as ventilation was concerned, he was of opinion that the air in the room with an 8-ft. ceiling would be more easily kept pure than in the one with the 10-ft. ceiling, keeping in view, of course, that he was referring to small houses for the working classes.

River Conservancy Boards.—The annual meeting of the Association for the Prevention of the Rivers of Scotland from Pollution, was held in Edinburgh last week. The report which was submitted advocated the appointment of Conservancy Boards throughout the country, who should have power to take such steps for the prevention of river pollution under provisions of the Act of 1876. The report suggested that the Council of the Association be empowered to petition the Government to appoint such boards. The report was adopted. Mr. David Milne Home, of Milne Graden, moved that this meeting is of opinion that there ought to be in this country a department of executive, one duty of which should be to look after the pollution of rivers, and see that they were kept free from such gross pollutions as not only unfit them for their necessary purposes, but convert them into carriers of nuisances in the districts through which they flow. Sir James Alexander seconded the motion, which was passed unanimously.

South Hants Waterworks.—These works, which are to supply a large and rapidly-increasing district, containing about 50,000 inhabitants, were opened on the 30th ult. by Lord Henry Scott, M.P., and the Right Hon. W. Cowper Temple, M.P., each of these gentlemen simultaneously opening hydrants in the market-place, Romsey, from which issued jets of water completely overtopping the highest houses, and fully demonstrating the pressure under which the company supply their district. The engineers of the works are Messrs. Russ & Minns, and the contractors Messrs. Easton & Anderson. The works were commenced less than twelve months since, and the mains laid are about thirty miles in extent. The supply is drawn from the chalk at Mitchell Marsh, about five miles from Romsey. After being softened by Clark's process, the water is pumped a distance of ten miles into a covered reservoir at Bassett, very near to and above the level of the reservoir of the Southampton corporation.

The Munich Foundry, according to the *Academy*, has been honoured with the commission to cast the German National Monument which it is proposed to erect in the Niederwald, close to Bingen on the Rhine. The work is designed by Professor Schilling, of Dresden. On a pedestal twenty-four mètres in height stands a figure of Germania pointing with uplifted hand to the symbol of German unity, the Imperial crown. The figure, which is ten mètres high, is considered by those able to judge a triumph of German plastic art. The model is shortly to be transported to Munich in a special train, and will there be put together before casting. Some difficulty exists with regard to the funds for this purpose. The cost of the monument has amounted to 1,100,000 marks, and a further sum of 350,000 marks is required. For this end a collection is to be made in every German town.

TENDERS

For the restoration and north aisle, St. Giles's Church, Lee, Malmesbury. Mr. C. J. Phipps, architect:—

Light & Smith	£1,830 0 0
Wall & Hook	1,726 0 0
Restall	1,702 0 0
Shallon & Knapp (accepted)	1,500 0 0
Brown	1,375 0 0

For new wing to the Ship Hotel, Mortlake, for Messrs. Phillips & Co. Mr. T. J. Lynes, architect:—

Turtle & Appleton	£997 0 0
Newton & Trigg	975 0 0
Lathey Bros.	948 0 0
Bowling & Miller	945 0 0
Went & Perkins	900 0 0
Kirk	873 0 0

For alterations and repairs at the Barley Mow, Horseferry-road, Westminster, for Mr. W. Rogers. Mr. J. M. Ferguson, architect:—

Lane	£180 10 0
Cole	173 0 0
Clark (accepted)	164 10 0

For the erection of new store, No. 2, and boiling-house and offices, at Marsh Gate-lane, Stratford, for Messrs. T. H. Harris & Sons. Mr. J. T. Newman, architect. Quantities supplied by Messrs. R. L. Curtis & Sons:—

Hosking Bros.	£1,295 0 0
North Bros.	1,150 0 0
Abrahams	1,095 0 0
Reed	999 0 0
Morter	993 0 0
Page	986 0 0
Allen	960 0 0
Laurence (accepted)	933 0 0

For the erection of the Oxford-street schools, for the Plymouth School Board, to accommodate 600 children. Mr. Silvanus Trevail, architect. Quantities by Mr. S. W. Elliott:—

Vernon & Ewins	£5,030 0 0
Blatchford & Sons	4,895 0 0
Julian & Sons	4,477 0 0
Steer	4,450 0 0
Berry	4,380 0 0
Bishop & Sons	4,178 0 0
Trevena	4,175 0 0
Palk & Partridge	4,060 0 0
Lapthorn & Good	4,025 0 0
Blowey	3,990 0 0
McMillan	3,974 0 0
Finch	3,969 0 0
Lethbridge	3,940 0 0
Foot	3,912 0 0

For alterations at the Oxford Arms, High-street, Camden-town, for Mr. F. Newport. Mr. Furniss, architect:—

Anley	£680 0 0
Toms	509 0 0
Gould & Brand	479 0 0
White	435 0 0
Somerville & Hill (accepted)	392 0 0

Pewtering.

Stone	£40 10 0
Watts	38 0 0
Somerville & Hill	37 10 0
Edwards (accepted)	37 0 0

For piling and fencing, Billingsgate Market, for the Markets Committee of the Corporation of London. Mr. Horace Jones, architect:—

Docwra	£323 5 0
Cook & Co.	250 0 0
Mowlem & Co.	198 0 0
Chapman	189 16 0
Mundy	180 0 0

For residence for Mr. P. S. Langton, Norfolk Park, Maidenhead. Messrs. Brown & Albury, architects:—

Kempsell	£2,525 0 0
Filewood	2,525 0 0
Simmonds	2,494 0 0
Silver & Son	2,464 0 0
Woodbridge Bros.	2,280 0 0
Kingerlee (accepted)	2,150 0 0

For three houses and shop, Angel-hill, Tiverton, for Mr. J. Carpenter. Part materials to be supplied. Mr. Herbert J. Jones, architect:—

Tucker & Williams	£1,090 0 0

For the construction of roads, sewers, and surface-water drains on the British Land Company's Estate at Woodgreen. Mr. Henry B. M'chell, surveyor:—

Keeble	£2,756 0 0
Jackson	2,668 0 0
Acock	2,657 0 0
Harris	2,655 0 0
Crockett	2,626 0 0
Killingback	2,580 0 0
Pizzey	2,550 0 0
Dunmore (accepted)	2,493 0 0
Richardson (withdrawn)	2,200 0 0

For stabling, at Wild's-rents, Bermondsey. Mr. J. Leaning, architect:—

Ryder	£3,423 0 0
Patrick	3,023 0 0
Tongue	2,894 0 0
Tarrant & Sons (accepted)	2,653 0 0
Greenwood & Sons	2,645 0 0
Sheppard	2,625 0 0

For the erection of the "Defoe Memorial Manse" at Tooting. Messrs. Tarring & Wilkinson, architects:—

Gough	£950 0 0
Atkinson	795 0 0
Manley	787 0 0
Langridge & Sons	750 0 0
Lovell	750 0 0
W. & H. Castle	721 0 0
Lawrence	715 0 0
Norris	700 0 0
Bebington	690 0 0

For alterations and repairs to the Prince Albert, Blackfriars-road, for Mr. Thos. Potts. Mr. Sewell, architect:—

	Allow for Old Fittings.
Regat	£431 ..... £10
Weaver & Frith	406 12
Deands	401 15
Everitt & Sons	339 19
Smith (accepted)	310 11

For building two houses at John-street, Pentonville, for Mr. E. Fletcher. Mr. T. H. Watson, architect:—

Regat (accepted)	£1,230 0 0

For building three houses at John-street, Pentonville, for Mr. Patterson. Mr. T. H. Watson, architect:—

Regat (accepted)	£1,877 0 0

For building workshops and stable at Warren-street, Chapel-street, Pentonville, for Mr. Reid. Mr. T. H. Watson, architect:—

Regat (accepted)	£215 0 0

TO CORRESPONDENTS.

Erratum.—In the account on p. 102 of Dob-lane Chapel, Failsworth, [the architects, Messrs. Adams & Son, should have been described as of King's Lynn.

J. M. G. (an advertisement).—G. W. W. (should have sent names of other tenderers and amounts).—E. C. R. (too late to be of use).—A. (shall have consideration).—F. A. R.—J. S. H.—H. L. H.—H. H.—C. C. H.—R. K.—F. I.—E. W.—S. P.—A. G.—R. B.—M. & Bons.—J. A. G.—W. & P.—P. J.—L. R. C.—J. H.—P. H.—H. S. L.—T. & W.—S. J. & Co.—H. B. M.—J. H. T. & Sons.—Mr. S.—H. C.—Miss M.—J. & S. S.—W. R.—J. H.—M. J. C.—J. M. R.—C. D.—H. T. P.—G. H.—J. H.

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

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